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Federal R & D Funding by Budget Function

Fiscal Years 1979-81

Division of Science Resources Studies
National Science Foundation

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Note: Detail in tables may not add to totals because of rounding. Percent and dollar increases and decreases are based on unrounded numbers and may not conform exactly to amounts shown in tables.

PREFACE

This report was originally based on R&D budget authority provided to the Office of Management and Budget (OMB) by the agencies as background for Special Analysis K: Research and Development in the 1981 budget, as presented to the Congress in January 1980. Further detailed program information was based on budget justification documents of the leading R&D support agencies and information provided directly to the National Science Foundation (NSF) by some of the smaller agencies. Continuing inflationary pressures later stimulated the adoption by the administration of budget reductions for both 1980 and 1981 to counter inflation. The report was extended to include these changes, and the amounts for 1980 recissions and 1981 budget amendments, as proposed, are also shown in the tables. The sources for budget changes were Fiscal Year 1981 Budget Revisions, March 1980 and a summary of reductions in R&D programs, dated April 17, 1980, both issued by OMB, and budget amendment justifications issued by the agencies.

Within the overall Federal budget there is no R&D budget as such nor are most appropriations for research and development so labeled except in the case of certain program areas in defense, space, energy, and environment. In order to reach an overall Federal R&D figure for purposes of analysis the R&D programs of individual agencies must be selected from agency budgets, sometimes in the form of line items and sometimes as sections under line items, and compiled into broader totals.

Each year one of the special analyses of the Federal budget provides R&D budget data through a reporting requirement placed on the agencies at the time of budget preparation. This analysis provides a view of the R&D portion of the budget in broad totals: Basic research, applied research, development, and support to universities and colleges, and also provides general descriptions of the R&D programs of the larger support agencies. It does not, however, provide an R&D array by budget functions or by individual programs.

This report helps to answer the need for such a detailed overview by taking the entire R&D portion of the Federal budget and arranging programs in a series of tables accompanied by brief program descriptions and grouped by budget functions. For organizational purposes the budget is divided into 17 functional areas. Funding for these functions plus allowances and undistributed offsetting receipts make up the budget total with no overlap occurring between functions or the agency programs within the functions. An immediate comparison is thus obtainable of the relative emphases given to various areas of Federal responsibility. By categorizing R&D program data by these same budget functions the ratio of R&D funding to total Federal funding within each function can be viewed as one measure of the role assigned to research and development in meeting the needs embodied in the functions.

By another comparison, the amounts of R&D funding for functions, shown together, provide a measure of relative R&D emphases and an indication of the kinds of resources within the "R&D producing" sectors of the economy that are likely to be called upon.

Function categories and definitions used in this report are the same as those used in the budget with one exception. The budget function of general science, space, and technology had been divided into two functions: Space research and technology and general science. Two budget functions--general purpose fiscal assistance and interest--have no R&D components.

This report is more a display than an analysis. Programs are identified by agency and presented in considerable detail. The text has been kept brief with the intention that the tables by their format will serve an analytic function. The discussion is concentrated on pointing up the chief funding changes and policy directions in 1981, with comparisons between the original budget presented in January and the revisions made in March.

The entire report is based on budget authority dollars rather than obligations or outlays since budget authority is the basis of congressional funding decisions. The data shown in this report agree for the most part with budget authority data supplied to OMB by the agencies for Special Analysis K and with later data provided by OMB in budget revision documents. Some changes were made based on information not available at the time the special analysis was prepared. The tables and discussion are, in effect, an elaboration of the administration position on the R&D portion of the 1981 budget.

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RESEARCH AND DEVELOPMENT IN THE 1981 BUDGET

Total budget authority requested for R&D programs in the revised 1981 budget is $36,496 million, or 12 percent more than the $31,814 million estimated for 1980. This growth compares with the 14-percent increase that was shown in the President's 1981 budget presented to the Congress in January 1980.

A continued rise in the rate of inflation subsequent to the budget message resulted in a change in budget policy. In March the administration submitted a number of budget amendments for 1981 and proposed recissions for 1980 that had the effect of reducing the 1980 R&D budget authority total by $205 million and the 1981 R&D budget authority total by $868 million. These changes were part of a 5-point strategy to counter inflation that included the goal of a budget surplus in 1981.

The leading features of R&D planning as embodied in the revised 1981 budget are as follows:

- An R&D total that represents an increase of 12 percent over 1980, allowing for some real growth.
- The focus of nearly all the growth in the national defense area; the R&D programs in this function are expected to grow 21 percent in 1981 over 1980, the same increase planned in January.
- An increase of 10 percent in general science, after budget amendments, compared with a projected increase of 15 percent in the January budget.
- Growth for space R&D programs of 7 percent in 1981, after budget amendments, compared with a projected increase of 11 percent in the January budget.
- An increase of 4 percent for health R&D programs, compared with 6 percent in the January budget.
- A decrease of 2 percent from 1980 to 1981 for overall energy R&D programs, compared with a decrease of 1 percent in the January budget. These decreases included proposed termination of the Clinch River breeder reactor project and decreases in fossil energy R&D programs although increases remain for solar, geothermal, and magnetic fusion R&D programs.
- An increase of 8 percent in 1981 budget authority for basic research, compared with 12 percent originally planned in January. Largest cuts were proposed in space and general science programs.

In the 1981 budget R&D programs are 5.1 percent of the requested total (based on the March revisions) and also 5.1 percent of the estimated 1980 total. 1/ Within individual functions, however, the R&D shares vary widely: from a fraction of 1 percent in several functions with small R&D programs to as much as 97 percent for space research and technology.

Shares of the R&D total

When R&D programs are viewed as a whole, the share of national defense within the total is by far the largest -- 51 percent in 1981, compared with 47 percent in 1980. The increase in the R&D share reflects the strong emphasis on defense versus other programs in the overall budget. The next three functions in size of share within the Federal R&D total in 1981 are space research and technology -- 14 percent; health -- 11 percent; and energy -- 10 percent. The next two functions, general science and natural resources and environment, account for 4 percent and 3 percent, respectively. The remaining 10 functions together account for 7 percent of all Federal R&D budget authority in 1981.

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[1] The 1980 total for this computation omits $35 billion in budget authority covering two unusual items: $15 billion in new borrowing authority for the Tennessee Valley Authority (TVA) and $20 billion for synthetic fuels promotion.

Budget authority for research and development by function[a]

/Dollars in millions/

		1980			1981		
	1979 actual	Jan. estimate	Proposed reduction	Revised estimate	Jan. estimate	Proposed reduction	Revised estimate
Total	$29,012	$32,019	-$205	$31,814	$36,364	-$868	$35,496
National defense	13,791	15,002	-43	14,959	18,135	-19	18,117
Space research and technology...	3,969	4,606	-	4,606	5,119	-201	4,918
Health	3,401	3,682	-32	3,650	3,887	-94	3,792
Energy	3,461	3,834	-69	3,765	3,799	-124	3,675
General science	1,119	1,246	-	1,246	1,435	-64	1,371
Natural resources and environment	1,010	1,090	-	1,090	1,144	-4	1,140
Transportation	798	870	-12	859	916	-41	875
Agriculture	552	604	-3	602	640	-6	634
Education, training, employment, and social services	352	495	-39	456	637	-299	338
Community and regional development	126	125	-8	117	142	-6	136
International affairs	113	124	-	124	131	-	131
Veterans benefits and services.	123	126	-	126	135	-5	130
Commerce and housing credit	92	107	-	107	119	-5	114
Income security	36	38	-	38	56	-	56
Administration of justice	47	48	-	48	46	-	46
General government	23	21	-	21	23	-	23

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[a] Listed in descending order of 1981 revised R&D budget authority. One budget function--general science, space, and technology--has been divided into two functions in this analysis: Space research and technology, and general science.

NATIONAL DEFENSE

In the 1981 budget, as revised, the national defense function accounts for 24 percent of total Federal budget authority while the R&D portion of the national defense function accounts for 51 percent of total R&D budget authority. Ratios approximate to these have prevailed since 1975.

Total R&D budget authority for this function, as revised, is expected to increase by $3,158 million, or 21 percent, between 1980 and 1981. This is the same relative increase as was shown in the January budget. Two agencies--the Department of Defense (DOD) and the Department of Energy (DOE)--sponsor all R&D activities in the national defense area.

The chief features of proposed national defense R&D funding for 1981 are these:

- An increase of 20 percent in DOD technology base programs, including an increase of 18 percent, to $518 million, for basic research.
- An increase of 54 percent in DOD strategic R&D programs, mostly caused by an $881 million increase for the M-X intercontinental ballistic missile.
- A 35-percent increase in DOD intelligence and communications R&D programs.
- A 14-percent increase in DOE atomic energy defense activities, including a 39-percent increase for the inertial confinement fusion program and a 29-percent increase for the defense waste management program.

In 1981 R&D budget authority as a share of total budget authority for the national defense function is an estimated 11.0 percent compared with 10.4 percent in 1980.

BEST DOCUMENT AVAILABLE

R&D budget authority for national defense

/Dollars in millions/

		1980			1981		
	1979 actual	Jan. estimate	Proposed change	Revised estimate	Jan. estimate	Proposed change	Revised estimate
Total	$13,791	$15,002	-$43	$14,959	$18,135	-$19	$18,117
Department of Defense/military	12,650	13,835	-41	13,795	16,799	-10	16,789
Research, development, test, and evaluation	12,209	13,327	-41	13,287	16,267	-10	16,257
Technology base	2,010	2,260	-1	2,259	2,724	-12	2,712
Advanced technology	525	638	-18	620	612	-16	595
Strategic programs	2,139	2,200	-12	2,187	3,374	-9	3,365
Tactical programs	5,088	5,225	-16	5,209	5,758	-10	5,748
Intelligence and communications	759	1,163	+1	1,164	1,571	+6	1,577
Defensewide mission support	1,689	1,841	+6	1,847	2,229	+32	2,260
Other DOD military	441	508	-	508	532	-	532
Atomic energy defense activities(DOE)	1,141	1,166	-2	1,164	1,336	-9	1,327
Inertial confinement fusion	105	115[a]	-	115	160	-	160
Naval reactors development	273	241	-	241	250	-	250
Weapons R&D and testing activities	597	628	-	628	708	-	708
Verification and control technology	30	37	-	37	41	-2	39
Materials production	10	13	-	13	16	-	16
Defense waste management	83	89	-2	87	115	-3	112
Nuclear materials security and safeguards	43	43	-	43	47	-4	43

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[a] Includes a $3 million supplemental request.

Department of Defense - Military

In the 1981 budget DOD programs make up 93 percent of all R&D budget authority for national defense. Almost all of these programs are funded under the research, development, test, and evaluation (RDT&E) appropriation.

The proposed revisions of RDT&E programs for both 1980 and 1981 are mostly directed to Air Force programs although Army and Navy programs are also involved. A variety of individual programs in different mission areas are cut back. Although proposed program reductions amount to $83 million in 1980 and $208 million in 1981, increases for fuel and transportation costs and increased prices for other purchases as well as some actual program increases make for net reductions in the RDT&E levels of $41 million in 1980 and only $10 million in 1981. Thus, total R&D budget authority for DOD is expected to increase from $13,795 million in 1980 to $16,789 million in 1981, or 22 percent. This increase compares with 9 percent from 1979 to 1980 and reflects the special emphasis placed on defense programs in the 1981 budget.

An increase of $453 million, or 20 percent, is planned for DOD technology base programs, continuing a policy of strong support to this mission area that has been in force since 1976. Technology base programs are entirely research, as distinct from development. DOD basic research programs, all subsumed in this mission area, are scheduled to grow 18 percent.

A decrease of $25 million, or 4 percent, is proposed for DOD advanced technology programs after growth of 22 percent in 1980.

A 54-percent increase, or $1,178 million, in DOD strategic R&D programs,is largely accounted for by plans to continue full-scale development of the Air Force M-X missile system. Other development programs contributing to this increase are the Army ballistic missile defense programs and the Air Force space defense systems and air launched cruise missile programs.

An increase of $539 million, or 10 percent, in DOD tactical R&D programs in 1981 follows almost level funding from 1979 to 1980. A large number of programs, all directed to development of combat systems for general purpose forces, are included in this mission area. Programs contributing to growth include Navy ship design and modernization, to be initiated in 1981, and the C-X program to improve rapid deployment capability via airlift, also to be initiated in 1981.

An increase of $413 million, or 35 percent, is proposed for DOD intelligence and communcations programs in 1981. Most of these programs are sponsored by the Air Force.

DOD defensewide mission support is expected to increase by $413 million, or 22 percent, in 1981.

Atomic energy defense activities

Atomic energy defense activities of $1,327 million make up 7 percent of the 1981 R&D budget authority for national defense. These DOE programs show an increase of $163 million, or 14 percent, over 1980 after slight budget cutbacks. This compares with almost no overall dollar increase in 1980. The weapons R&D and testing activities program, which comprises more than one-half of the R&D total, is expected to grow by 13 percent in 1981 to cover increased computer leasing costs and anticipated inflation. Naval reactors development is expected to increase only 4 percent. The inertial confinement fusion program, however, shows proposed growth of 39 percent in 1981, and the defense waste management program shows proposed growth of 29 percent. These last two programs reflect growth in 1981 considerably greater than in 1980.

SPACE RESEARCH AND TECHNOLOGY

Within this function all activity is conducted by the National Aeronautics and Space Administration (NASA). Total budget authority requested for 1981 in the January budget for space research and technology was $5,119 million, an increase of 11 percent over 1980. The March budget amendment reduced this request by $201 million, to $4,918 million, producing an increase of 7 percent over 1980. This relative increase is based on a 1980 level of $4,606 million that includes a $300 million supplemental appropriation request for the space shuttle not yet approved by the Congress. The following are leading features of the new budget:

- An increase of 8 percent in basic research funding originally planned in the 1981 budget has been changed to a decline of 6 percent.

- The revised budget, however, maintains funding for two major new initiatives contained in the January budget: the gamma ray observatory and the national oceanic satellite system.

- A current decrease of 5 percent in support for space science programs, from $717 million in 1980 to $680 million in 1981 (revised), compares with a 10-percent increase proposed in January.

- A proposed March budget amendment decrease of $109 million in the January estimate for space science in 1981 is primarily based on scheduled slips for the international solar polar mission and a 1- to 2-year delay in achieving the planned flight rate for spacelab experiments.

- An increase of 6 percent in support for space and terrestrial applications to $500 million in 1981 (revised) compares with a 12-percent increase proposed in January.

- The March budget amendments include proposed decreases of $58 million in the January budget for 1981 for space and terrestrial applications programs and a partially offsetting increase of $30 million for the Landsat-D program. The $58 million reduction is based primarily on reductions and deferrals in planned spacelab payloads, scheduled slips in the earth radiation budget experiment and the halogen occultation experiment, deferred initiation of lead time activities for an operational Landsat system, and decreased emphasis on technology transfer activities.

o An increase of 11 percent, to $3,126, in support for space transportation systems (STS) in 1981 (revised) compares with a 13-percent recommended increase in January. The revised budget continues a commitment to the development of the space shuttle, permitting the first flight in late 1980 or early 1981 with regular operations beginning in 1982.

o The proposed March reduction of $48 million in the January estimate for STS programs in 1981, all in the space flight operations area, would delay the planned buildup of the space shuttle flight rate consistent with reductions in other areas.

All the activities under space research and technology are either conduct of research and development or construction of R&D facilities. Thus, the ratio of R&D budget authority to total budget authority for this function is high -- approximately 97 percent in 1981.

R&D budget authority for space research and technology

/Dollars in millions/

	1979 actual	1980 estimate	1981 Jan. estimate	1981 Proposed reduction	1981 Revised estimate
Total	$3,969	$4,606	$5,119	-$201	$4,918
National Aeronautics and Space Administration	3,969	4,606	5,119	- 201	4,918
Space transportation systems.	2,401	2,819[a]	3,173	- 48	3,126
Space science, applications, and technology	1,224	1,411	1,545	- 143	1,402
Space science	626	717	788	- 109	680
Space and terrestrial applications	394	473	528	- 28	500
Space research and technology	175	190	195	- 6	188
Energy technology	29	31	34	(b)	34
Supporting activities (tracking and data acquisition)	343	376	400	- 11	390

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[a] Includes a $300 million supplemental appropriation request.

[b] Less than $500,000.

Space transportation systems (STS)

This program provides all the transportation and related capabilities required to conduct space operations. The increase of $354 million, or 13 percent, that was proposed in the January budget for 1981 was entirely related to space flight operations in connection with the first orbital flight of the shuttle and future operations. The proposed March reduction of $48 million in the January estimate, almost all in the space flight operations area, would delay the planned buildup of the space shuttle flight rate consistent with reductions in other NASA program areas.

R&D budget authority for space transportation systems

[Dollars in millions]

	1979 actual	1980 estimate	1981 Jan. estimate	1981 Proposed reduction	1981 Revised estimate
Total	$2,401	$2,819	$3,173	-$48	$3,126
Space shuttle	1,638	1,886[a]	1,873	-	1,873
Design, development, test, and evaluation	1,270	1,031	683	-	683
Orbiter	728	561	321	-	321
Main engine	173	141	146	-	146
External tank	105	79	48	-	48
Solid rocket boaster	115	61	14	-	14
Launch and landing	150	188	154	-	154
Changes/system upgrading	-	100	150	-	150
Production	368	755	1,040	-	1,040
Orbiter	265	573	768	-	768
Main engine	76	124	122	-	122
Launch and landing	7	16	40	-	40
Spares and equipment	21	43	110	-	110

	1979 actual	1980 estimate	Jan. estimate	1981 Proposed reduction	Revised estimate
Space flight operations	300	447	810	-42	768
Space transportation systems operations capability development	65	54	89	-10	79
Space transportation system upper stage	19	18	39	-10	29
Multimission and payload support equipment	10	10	13	-	13
Mission control center(MCC) upgrading level II	10	13	16	-	16
Payload and operations support	10	11	11	-	11
Thrust augmentation	4	2	10	-	10
Teleoperator retrieval system	11	-	-	-	-
Development test and mission support	177	173	184	-	184
Research and test support	42	31	32	-	32
Data systems and flight support	56	36	40	-	40
Operations support	34	44	46	-	46
Launch systems support	45	62	65	-	65
Advanced programs	7	13	11	-2	9
Spacelab	27	59	152	-2	150
Space transportation system operations	24	148	375	-28	347
Shuttle operations	15	119	321	-25	296
Spacelab operations	-	-	2	-	2
Upper stage operations	3	19	33	-2	31
Payload support	6	10	20	-2	18
Expendable launch vehicles	74	71	56	-	56
Scout	11	5	2	-	2
Centaur	17	18	6	-	6
Delta	46	46	48	-	48
Atlas F	-	1	-	-	-
Research and program management	390	416	435	-6	429

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[a] Includes a $300 million supplemental request.

- The estimate of $1,886 million in budget authority for the space shuttle for 1980 is approximately $520 million higher than the original 1980 budget request. This increase results from a budget amendment of $220 million already approved by the Congress plus a $300 million supplemental request submitted in January 1980 along with the 1981 budget. The 1981 budget request of $1,873 million for the space shuttle represents a decline of 1 percent from 1980, based on the assumption that the supplemental request will be approved.

- The design, development, test, and evaluation phase of the shuttle program is expected to decrease $348 million, or 34 percent, in 1981 while the production program will increase $285 million, or 38 percent. Technical problems have caused postponement of the first manned orbital flight of the shuttle to late 1980.

- The revised 1981 estimate of $768 million for space flight operations represents a 72-percent increase over 1980 and still provides for expanded support for all major elements of this program as the STS moves towards the operational stage.

- The proposed $10 million reduction of the January estimate for 1981 for the inertial upper stage (IUS) under the STS operations capability development program will result in a 1-year slip in the development schedule. The January estimate supported a 1983 launch of the international solar polar mission, which has been delayed to 1985 under the budget amendment. The IUS program will be rephased to support the Galileo launches planned for 1984.

- Funds for the spacelab, a major element of STS, are expected to increase from $59 million in 1980 to $150 million in 1981. This program is being carred out jointly by NASA and the European Space Agency to provide a versatile, reusable space laboratory, which will be flown to and from Earth orbit in the cargo bay of the shuttle.

- The proposed March reductions of $28 million in the January estimates for STS operations in 1981 are consistent with the rescheduling of the international solar polar mission from 1983 to 1985.

- Funds for expendable launch vehicles are expected to decline by an estimated $15 million, or 21 percent, as the shuttle takes over an increasing proportion of payload launches.

Space science

This program utilizes space systems to conduct a broad spectrum of scientific investigations. The objective is to advance knowledge of the Earth and its space environment, the Sun, the planets, interplanetary and interstellar space, the other stars of our galaxy, and the universe. The January 1981 budget request provided for an overall increase of $71 million, or 10 percent over the 1980 level, with increases for physics and astronomy more than offsetting proposed decreases in planetary exploration. The revised 1981 estimate reflects an overall decrease of $37 million, or 5 percent.

- The 1981 revised request for physics and astronomy provides for an increase of $10 million, or 3 percent, over the 1980 level, compared with a 30-percent increase proposed in the January budget. A budget amendment reduction of $43 million in the January estimate for the international solar polar mission would result in a 2-year delay in launch, from 1983 to 1985. The proposed reduction of $43 million for shuttle/spacelab payload development and mission support would result in a 1- to 2-year delay in early physics and astronomy shuttle/spacelab science activities.
- The revised 1981 budget retains funds for the initiation of a new project, the gamma ray observatory, leading to a 1985 launch. This program is designed for study of the full sky over the total range of the gamma ray energies. The revised budget also maintains funds for development of the Earth-orbiting space telescope, scheduled for launch by the space shuttle in 1983.
- The expected decline of $45 million, or 20 percent, from 1980 to 1981 in planetary exploration reflects decreased funding for Galileo development (the Jupiter orbiter and probe). The Galileo mission was originally scheduled to be launched as a single spacecraft in January 1982. Problems with the space shuttle and its initial upper stage have now brought about a revision in plans, including separate launches for orbiter and probe spacecraft in 1984.

R&D budget authority for space science

[Dollars in millions]

	1979 actual	1980 estimate	1981 Jan. estimate	1981 Proposed reduction	1981 Revised estimate
Total	$626	$717	$788	-$109	$680
Physics and astronomy	283	337	439	-92	347
High-energy astronomy observatories development	11	2	-	-	-
Solar maximum mission development	17	3	-	-	-
Space telescope development	79	113	119	-	119
International solar polar mission development	13	48	83	-43	40
Gamma ray observatory development	-	-	19	-	19
Shuttle/spacelab payload development and mission management	35	41	72	-43	29
Explorer development	31	32	33	-	33
Mission operations and data analysis	25	37	39	-	39
Research and analysis	44	34	43	-6	37
Suborbital program	28	27	31	-	31
Planetary exploration	182	220	180	-4	175
Galileo development	79	116	63	-	63
Mission operations and data analysis	59	59	65	-4	61
Research and analysis	44	45	52	-	52
Life sciences	40	44	50	-11	39
Life sciences flight experiments.............	16	17	19	-7	13
Research and analysis	24	27	31	-4	26
Research and program management	120	116	120	-2	119

Space and terrestrial applications

This program uses space, aircraft, and ground-based systems to identify and demonstrate the useful applications of space techniques in the areas of advanced communications satellite systems technology, materials processing research and experimentation, and remote sensing to assist in solution of Earth resources and environmental problems. The January 1981 budget request provided for an overall increase of $55 million, or 12 percent, for this program. The budget amendment reduction of $28 million changes the growth from 1980 to 1981 to 6 percent. The budget amendment includes proposed reductions of $58 million in the original estimates for 1981 and a partially offsetting increase of $30 million to provide for cost increases in the Landsat-D program.

- o The $30 million increase in the original budget estimate for 1981 for Landsat-D under resource observations is the result of unanticipated increases in development costs for the thematic mapper and space and ground segments. It is expected that Landsat-D will not be launched in 1981, as originally planned. The budget amendment decrease of $16 million reflects a deferral of funds for the initiation of lead time activities for an operational land observing system. The revised 1981 budget request, however, preserves the increase for agricultural remote sensing (AgRISTARS). This program would grow from $16 million in 1980 to $33 million in 1981. The objective of this joint activity is to extend the application of aerospace technology to crop production estimation and to provide quantitative early warning capabilities.

- o The revised 1981 budget request for environmental observations shows virtually no change over the 1980 level as a result of a proposed March reduction of $28 million in the January budget. The largest cutback, $12 million, is proposed for the earth radiation budget experiment. Launch of this experiment will be delayed from 1983 to 1984. The revised budget for applied research and data analysis will provide for most ongoing activities although a proposed reduction of $6 million would defer expansion of activities related to severe storms, ocean processes, stratospheric and tropospheric air quality, and global weather. Funds are maintained for the initiation of a national oceanic satellite system (NOSS) project, in cooperation with the National Oceanic and Atmospheric Administration and DOD.

- o A $10 million increase is proposed for the applied research and analysis activity under space communications. This expansion reflects a new program to develop advanced communications technology that would increase the useful range of radio frequencies.

R&D budget authority for space and terrestrial applications

/Dollars in millions/

	1979 actual	1980 estimate	1981 Jan. estimate	1981 Proposed change	1981 Revised estimate
Total	$394	$473	$528	-$28	$500
Resource observations	139	145	162	+8	170
Landsat-D	98	99	64	+30	94
Operational land observing system	-	-	16	-16	-
Magnetic field satellite	4	2	1	-	1
Shuttle/spacelab payload development	6	2	2	-	2
Extended mission operations	(a)	2	3	-	3
Geodynamics	8[b]	13[b]	25	-	25
Applied research and data analysis	22	13	19	-6	13
AgRISTARS	-	16	33	-	33
Landsat-3	1	-	-	-	-
Heat capacity mapping mission	(a)	-	-	-	-
Environmental observations	68	109	138	-28	110
Upper atmospheric research program	(15)[c]	13	14	-	14
Applied research and data analysis	34	49	56	-6	50
Shuttle/spacelab payload development	8	10	8	-6	2
Operational satellite improvement program	6	7	11	-2	9
Earth radiation budget experiment	7	17	29	-12	17
Halogen occulation experiment	4	8	6	-2	5
Extended mission operations	1	6	8	-	8
National oceanic satellite system	-	-	6	-	6
Tiros-N	1	-	-	-	-
Nimbus-7	4	1	-	-	-
Seasat	4	-	-	-	-
Applications systems	14	25	18	-	18
Technology transfer	11	10	13	-5	8
Materials processing in space	20	20	22	-	22
Space communications	23	23	29	-	29
Technology utilization	9	12	13	-1	12
Research and program management	110	129	133	-2	131

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[a] Less than $500,000.

[b] Funding responsibility for laser network operations was transferred from space tracking and data systems to space applications in 1981. Budget authority of $7 million in 1979 and $8 million in 1980 is not included in the totals.

[c] Program transferred from space sciences to space applications in 1980; fiscal year 1979 funding not included in total.

Space research and technology

The objectives of this program are to provide a technology base which will adequately support current and future space activities and to provide approaches for reducing the costs of future space activities through improvement of components. The 1981 revised budget reflects a decrease of $3 million from the 1980 level.

R&D budget authority for space research and technology

/Dollars in millions/

			1981		
	1979 actual	1980 estimate	Jan. estimate	Proposed reduction	Revised estimate
Total	$175	$190	$195	-$6	$188
Research and technology base	86	100	103	-3	100
Entry fluid physics research and technology	5	5	6	(a)	6
Chemical propulsion research and technology	9	9	9	(a)	9
Materials and structures research and technology	16	16	17	-1	16
Electronics and automation research and technology	8	9	9	(a)	9
Space power and electric propulsion research and technology	17	20	20	-1	20
Multidisciplinary research and technology	2	3	3	(a)	3
Information systems research and technology	16	21	23	-1	22
Spacecraft systems research and technology	5	7	9	(a)	9
Transportation systems research and technology	7	10	8	(a)	8
Systems technology programs	12	11	10	-2	8
Standards and practices	9	5	2	-	2
Research and program management	68	75	79	-1	78

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[a] Less than $500,000.

R&D budget authority for supporting activities (tracking and data acquisition)

/Dollars in millions/

	1979 actual	1980 estimate	1981		
			Jan. estimate	Proposed reduction	Revised estimate
Total	$343	$376	$400	-$11	$390
Operations	250	265	272	-2	270
Space flight tracking and data network	127	136	134	NA	NA
Deep space network	51	50	55	NA	NA
Aeronautics and sounding rocket support	5	5	6	NA	NA
Communications	34	38	39	NA	NA
Data processing	33	36	38	NA	NA
Systems implementation	40	57	76	-8	68
Space flight tracking and data network	14	17	23	-	23
Deep space network	10	22	23	-	23
Aeronautics and sounding rocket support	4	4	7	-	7
Communications	5	4	6	-	6
Data processing	7	10	18	-8	10
Advanced systems	10	11	11	-	11
Research and program management	43	43	41	1	41

HEALTH

The revised R&D budget authority for health reflects an increase of $142 million, or 4 percent, in 1981. The major changes from 1980 to 1981 within the revised total are as follows:

- An increase of 5 percent, to $1,795 million, in 1981 for basic research.
- An increase of 4 percent in R&D budget authority for the National Institutes of Health (HHS).
- An increase of 11 percent for R&D programs under the Alcohol, Drug Abuse, and Mental Health Administration (HHS).
- An increase of 18 percent in R&D budget authority for the Office of the Assistant Secretary for Health (HHS).

R&D budget authority as a share of total budget authority for health shows a decline from 6.1 percent in 1980 to 5.3 percent in 1981 as a result of large estimated increases in medicare and medicaid programs.

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R&D budget authority for health

/Dollars in millions/

	1979 actual	1980 Jan. estimate	1980 Proposed reduction	1980 Revised estimate	1981 Jan. estimate	1981 Proposed reduction	1981 Revised estimate
Total	$3,401	$3,682	-$32	$3,650	$3,887	-$94	$3,792
Health research	3,330	3,607	-32	3,575	3,806	-94	3,711
National Institutes of Health (HHS)	2,957	3,191	-32	3,159	3,355	-85	3,270
Alcohol, Drug Abuse, and Mental Health Administration (HHS)	216	237	-	237	262	-	262
Center for Disease Control (HHS) ...	74	92	-	92	95	-	95
Disease control	23	25	-	25	26	-	26
Occupational health	52	67	-	67	70	-	70
Assistant Secretary for Health (HHS)	34	33	-	33	42	-3	39
National Center for Health Services Research	NA	30	-	30	35	-	35
National Center for Health Care Technology	NA	3	-	3	8	-3	5
Health Care Financing Adm. (HHS) ...	17	31	-	31	35	-6	29
Health Services Administration (HHS)	17	17	-	17	16	-	16
Health Resources Adm. (HHS)	5	-	-	-	-	-	-
Special foreign currency prog. (HHS).	11	7	-	7	-	-	-
Consumer and occupational health & sfty.	72	74	-	74	81	-	81
Food and Drug Administration (HHS)..	61	64	-	64	67	-	67
Foods research	22	22	-	22	22	-	22
Drugs and devices research	20	22	-	22	23	-	23
Radiological products research ...	10	10	-	10	10	-	10
National Center for Toxicological Research	9	11	-	11	12	-	12
Occupational Safety and Health Administration (Labor)	7	7	-	7	11	-	11
Consumer Product Safety Commission..	4	4	-	4	4	-	4

National Institutes of Health

The National Institutes of Health (NIH) make up the major component of the health function, accounting for approximately 85 percent of the R&D total. The revised estimates for R&D budget authority for NIH provide for an increase of $111 million, or 4 percent, in 1981 over the 1980 level. The January budget for NIH reflected a shift in emphasis from contract support to research project grants in an effort to provide long-term stability to investigator-initiated research grants. This budget called for stabilization of the number of new and continuing research project grants at about 5,000. The proposed reductions to the January level do not jeopardize this commitment.

The National Institute of Environmental Health Sciences reflects the largest relative increase under the revised budget--13 percent. Three areas identified for increased emphasis are (1) non-ionizing radiation, (2) immunotoxicity studies (aimed at developing information on how and why toxic chemicals, natural or manmade, attack an organism's immune system and negatively affect the ability of the system to respond to biological and biochemical insults), and (3) studies to develop better methods to extrapolate animal test data to exposure of man.

The National Institute of Arthritis, Metabolism, and Digestive Diseases reflects the largest actual increase, $28 million, and the second largest relative increase, 9 percent, in 1981. Consistent with overall NIH policy, this expansion is proposed for investigator-initiated research.

R&D budget authority for the National Cancer Institute shows a small decline, of less than 1 percent, in 1981 as a result of the proposed reduction of $41 million from the January level. This recommended cut is primarily in R&D contracts and does not affect an increase of $22 million for research project grants in 1981. The major single program affected by the 1981 budget amendments is the carcinogenesis testing program supported through the National Toxicology Program. The $20 million increase proposed for this program in the January budget was eliminated in the revisions.

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R&D budget authority for the National Institutes of Health (HHS)

/Dollars in millions/

		1980			1981		
	1979 actual	Jan. estimate	Proposed reduction	Revised estimate	Jan. estimate	Proposed reduction	Revised estimate
Total	$2,957	$3,191	-$32	$3,159	$3,355	-$85	$3,270
Cancer	897	956	-14	942	979	-41	938
Epidemiology	NA	44	(a)	44	45	1	44
Carcinogenesis (physical and chemical)	NA	139	-3	136	162	-22	140
Biological carcinogenesis	NA	104	-2	102	104	-5	99
Nutrition	NA	16	-	16	18	-1	17
Tumor biology	NA	90	-1	90	91	-1	89
Immunology	NA	83	-1	82	83	-1	83
Diagnostic research	NA	36	-1	35	36	-2	34
Preclinical treatment research	NA	140	-2	138	141	-3	138
Clinical treatment research	NA	150	-1	148	151	-2	149
Rehabilitation research	NA	2	-	2	2	-	2
Cancer centers support	NA	68	-	68	68	-	68
Cancer control	NA	70	-5	65	65	-3	62
Research manpower development	NA	15	-	15	13	-1	12
Heart, lung, and blood	488	492	-4	488	515	-12	503
Heart and vascular diseases	NA	286	-4	422	297	-10	432
Lung diseases	NA	69			72		
Blood diseases and resources	NA	70			73		
Intramural research	NA	39	(a)	39	43	-1	41
Direct operations and program management	NA	28	-	28	30	(a)	30
Arthritis, metabolism, and digestive diseases	287	320	-3	317	350	-5	345
Arthritis, bone, and skin diseases	NA	52	(a)	52	59	-1	58
Diabetes, endocrinology and metabolism	NA	117	-2	116	126	-2	125
Digestive diseases and nutrition	NA	48	-1	48	54	-1	54
Kidney disease, urology, and hematology	NA	49	(a)	49	55	-1	55
Intramural research	NA	41	(a)	41	42	-1	42
Direct operations and program management	NA	13	-	13	13	(a)	13
General medical sciences	230	263	-1	263	275	-4	272
Cellular and molecular basis of disease	NA	84	-	84	93	-	93
Genetics	NA	93	-	93	101	-1	100
Pharmacological sciences	NA	35	-	35	34	-1	33
Physiology and biomedical engineering	NA	43	-1	42	39	-2	37
Intramural research	NA	1	-	1	1	-	1
Direct operations and program management	NA	7	(a)	7	8	(a)	8

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		1980			1981		
	1979 actual	Jan. estimate	Proposed reduction	Revised estimate	Jan. estimate	Proposed reduction	Revised estimate
NIH (cont'd)							
Neurological and communicative disorders and stroke	204	233	-2	231	242	-3	239
Communicative disorders	NA	32	(a)	31	33	(a)	33
Neurological disorders	NA	75	-	75	77	-1	77
Stroke and nervous system trauma	NA	41	-1	40	42	-1	41
Fundamental neurosciences	NA	32	(a)	32	35	-	35
Intramural research	NA	39	(a)	39	40	-1	39
Direct operations and program management	NA	14	(a)	14	14	(a)	14
Allergy and infectious diseases	183	205	-1	204	220	-2	218
Immunology, allergic and immunologic diseases	NA	61	(a)	60	66	(a)	65
Microbiology and infectious diseases	NA	96	-1	96	104	-1	103
Intramural research	NA	37	(a)	37	38	(a)	38
Direct operations and program management	NA	11	(a)	11	12	(a)	11
Child health and human development	187	199	-1	198	209	-3	206
Research for mothers and children	NA	96	-1	95	101	-1	100
Population	NA	70	(a)	70	74	-1	73
Intramural research	NA	22	-	22	22	(a)	22
Direct operations and program management	NA	11	(a)	11	11	(a)	10
Eye	100	105	-	105	113	-1	112
Retina and choroidal diseases	NA	40	-	40	43	(a)	43
Corneal diseases	NA	13	-	13	14	(a)	14
Cataract	NA	9	-	9	10	(a)	10
Glaucoma	NA	10	-	10	11	(a)	11
Sensory motor disorders and rehabilitation	NA	19	-	19	20	(a)	20
Intramural research	NA	10	-	10	10	(a)	10
Direct operations and program management	NA	4	-	4	4	(a)	4
Environmental health	73	77	-1	77	90	-4	87
Prediction, detection, and assessment of environmentally caused diseases and disorders	NA	22	(a)	22	25	-1	24
Mechanisms of environmental diseases and disorders	NA	16	-	16	18	-1	17
Environmental health research	NA	10	(a)	10	11	-1	10
Intramural research	NA	25	(a)	25	31	-1	30
Direct operations and program management	NA	5	-	5	5	-	5

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	1979 actual	1980			1981		
		Jan. estimate	Proposed reduction	Revised estimate	Jan. estimate	Proposed reduction	Revised estimate
NIH (cont'd)							
Aging	54	67	-1	67	73	-1	72
Aging research	NA	49	(a)	49	54	-1	53
Intramural research	NA	13	(a)	13	14	(a)	13
Direct operations and program management	NA	5	(a)	5	5	(a)	5
Dental	61	64	-	64	66	-1	66
Caries research	NA	11	-	11	11	(a)	11
Periodontal diseases	NA	7	-	7	8	-	8
Restorative materials	NA	3	-	3	3	-	3
Craniofacial anomalies	NA	7	-	7	8	-	8
Pain control and behavior studies	NA	3	-	3	3	-	3
Soft tissue, stomatology, and nutrition	NA	6	-	6	6	-	6
Dental research institutes	NA	8	-	8	7	-	7
Intramural research	NA	14	-	14	14	(a)	14
Direct operations and program support	NA	5	-	5	5	(a)	5
Research resources	154	169	-5	164	184	-11	173
Clinical research	NA	56	(a)	56	62	-2	60
Biotechnology research	NA	17	-1	17	23	-4	19
Laboratory animal sciences and primate research	NA	24	(a)	24	26	-1	25
Biomedical research support	NA	48	-2	46	49	-2	47
Minority biomedical support	NA	18	-2	16	19	-2	17
Direct operations and program management	NA	6	(a)	5	6	(a)	6
John E. Fogarty International Center	9	9	-	9	9	-	9
National Library of Medicine	10	11	-	11	10	-	10
Office of the Director	19	20	(a)	20	20	(a)	20

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[a] Less than $500,000.

Alcohol, Drug Abuse, and Mental Health Administration (ADAMHA)

The requested increase of $25 million, or 11 percent, for R&D programs of ADAMHA in 1981 represents the second annual increment of funding to implement the recommendations of the President's Commission on Mental Health.

An $18 million increase for general mental health research provides for continued expansion of R&D programs related to prevention of mental illness; utilization and delivery of mental health services, particularly in respect to underserved populations; and increased emphasis on major mental illnesses.

A $3 million new program included in the 1981 budget for work on treatment services accounts for most of the increase in drug abuse research. Of this, $2 million represents continuation of grants and contracts initially supported under another program--the community programs demonstration projects. Approximately $1 million will be used to support new awards in the areas of family services/therapy, minority programs, and women's programs.

R&D budget authority for the Alcohol, Drug Abuse, and Mental Health Administration (HHS)

/Dollars in millions/

	1979 actual	1980 estimate	1981 estimate
Total	$216	$237	$262
General mental health research	144	161	179
Major mental illnesses	29	32	34
Schizophrenia	15	17	19
Depression	13	14	15
Services delivery	16	16	18
Epidemiology of mental illness	5	6	7
Underserved or special populations	24	26	30
Minorities	11	11	13
Child and adolescent	7	7	8
Elderly	7	8	9
Prevention	(a)	4	6
Other program areas	57	62	69
Neurological, behavioral, and other studies	22	24	27
Social problems	14	13	15
Neurological disorders	11	12	13
Rape	3	4	6
Neurosis and personality disorders	4	5	5
Life change events	3	3	3
Program support	13	15	16
Drug abuse research	47	50	55
Extramural research	39	42	46
Epidemiology	NA	3	3
Etiology	NA	3	3
Hazards	NA	5	5
Prevention	NA	2	2
Treatment and methodologies	NA	7	7
Basic research	NA	16	17
Treatment services research	NA	-	3
General research support	NA	6	6
Intramural research	4	4	4
Program support	4	4	4
Alcoholism research	24	24	27
St. Elizabeths Hospital	2	2	2

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[a] Less than $500,000.

Assistant Secretary for Health

Proposed R&D budget authority (revised) for the Office of the Assistant Secretary for Health (HHS) shows an increase of $6 million, or 18 percent, in 1981. A $5 million increase for the National Center for Health Services Research would support new areas of research, including disease prevention and health promotion, manpower modeling, hospital productivity, and ethical issues in health services delivery.

R&D budget authority for the newly established National Center for Health Care Technology is increased from $3 million in 1980 to $5 million in 1981 in the revised estimates. The center provides a central focus for the evaluation of the benefit/risks, cost effectiveness, and societal effects of health care technologies.

ENERGY

The revised estimates for R&D budget authority for energy show a decline of 2 percent in 1981 from the 1980 level. The administration policy of providing Federal support to complement the work of the private sector by supporting longer-term, high-risk R&D programs is continued. Private development of new and improved energy technologies that use domestic resources is encouraged through rising energy prices, tax credits, and regulatory incentives. Three agencies are involved in R&D efforts in energy: DOE, the Nuclear Regulatory Commission (NRC), and the Environmental Protection Agency (EPA). Major changes in 1981 for energy R&D programs under the revised estimates are as follows:

- An increase of 16 percent in basic research to $229 million in 1981 over 1980.

- Increases in 1981 over 1980 for solar R&D programs (15 percent) geothermal (17 percent) and magnetic fusion (17 percent).

- A decrease of 22 percent in nuclear fission, primarily reflecting large cutbacks in the liquid metal fast breeder reactor program, including the termination of the Clinch River breeder reactor project.

- A decrease of 12 percent in fossil energy R&D programs. It should be noted, however, that the 1981 budget includes a request for an increase in R&D plant funds (not included in this report) for construction of demonstration plants.

Energy R&D budget authority as a percent of total energy budget authority is an estimated 53 percent in 1981. This compares with an estimated 66 percent in 1980, excluding from the total $15 billion in new borrowing authority for the Tennessee Valley Authority and $20 billion to cover the first phase of activities of the Energy Security Corporation.

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R&D budget authority for energy

/Dollars in millions7

		1980			1981		
	1979 actual	Jan. estimate	Proposed reduction	Revised estimate	Jan. estimate	Proposed reduction	Revised estimate
Total	$3,461	$3,834	-$69	$3,765	$3,799	-$124	$3,675
Department of Energy[a]..........	3,192	3,479	-34	3,444	3,414	-101	3,313
Solar	463	503	-	503	600	-20	580
Geothermal	132	112	-	112	131	-	131
Hydropower	5	4	-	4	1	-	1
Nuclear fission	1,006	1,020	-6	1,014	793	-7	786
Magnetic fusion	211	240	-	240	286	-5	281
Fossil energy	668	767	-24	743	684	-31	653
Electric energy systems and storage	95	100	-	100	109	-	109
Environmental R&D	195	216	-	216	241	-22	219
Supporting research	192	220	-	220	274	-16	259
Energy conservation	226	295	-4	291	294	-	294
Nuclear Regulatory Commission..	157	204	-	204	228	-	228
Environmental Protection Agency	113	101	-	101	108	-	108
Energy Security Trust Fund	-	50	-35	15	50	-23	27

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[a] The inclusion of revised estimates of budget authority for DOE R&D plant would add $571 million in 1979, $609 million in 1980, and $833 million in 1981.

Solar energy

The 1981 revised budget provides for an increase of 15 percent for solar energy R&D activities of DOE. These activities consist of three elements: solar technology and solar applications within the energy supply R&D appropriation and solar within the energy production, demonstration, and distribution appropriation.

Solar technology programs are designed to establish the technical and market readiness of a broad range of renewable energy resources with the objective of supplying residential, commercial, industrial, agricultural, transportation and utility demands for energy in an environmentally acceptable manner. The proposed increase of $66 million, or 19 percent, for solar technology provides for substantial expansion in wind energy conversion systems (73 percent) and an increase of 27 percent in solar thermal power systems. In the 1981 budget $11 million is included for solar international activities to provide for the development and implementation of cooperative agreements in renewable technology areas.

The solar applications programs are intended to stimulate market acceptance and demand for solar products for residential, commercial, industrial, and agricultural applications. An increase of $19 million, or 14 percent, is proposed for solar applications in the revised estimates, down from the 29-percent increase proposed in January.

- The proposed March reduction of $15 million in the January estimate for the photovoltaic (PV) programs within market test and commercial applications includes $5 million from the Federal PV systems purchase effort and $10 million from the proposed multiyear purchase to test international and private domestic markets. The decrease of $19 million from 1980 to 1981 in the buildings area results from the transfer of some activities to other programs.
- The increase of $19 million in 1981 over 1980 for market development and training provides $8 million for support of programs transferred from market test and commercial applications as well as expanded support for the installer training program and increases for support of the national solar user information program.

R&D budget authority for solar energy

/Dollars in millions/

	1979 actual	1980 estimate	1981 Jan. estimate	1981 Proposed reduction	1981 Revised estimate
Total	$463	$503	$600	-$20	$580
Solar technology	308	350	416	-	416
Biomass energy systems	42	54	58	-	58
Solar thermal power systems	67	73	93	-	93
Photovoltaic energy systems	104	140	133	-	133
Wind energy conversion systems	58	45	78	-	78
Ocean systems	27	35[a]	38	-	38
Solar international activities	-	-	11	-	11
Solar information activities	-	-	1	-	1
Technology support and utilization	7	-	-	-	-
Program direction	3	4	4	-	4
Solar applications	126	135	174	-20	154
Systems development	40	52	55	-5	50
Market test and commercial applications	81	60	73	-15	58
Photovoltaic	15	10	35	-15	20
Agricultural and industrial process heat	11	14	21	-	21
Buildings	55	36	17	-	17
Market development and training	3	21	40	-	40
Solar international applications	-	-	4	-	4
Program direction	2	3	3	-	3
Solar	29	19	10	-	10
Federal buildings	26	12	2	-	2
Market analysis	3	6	7	-	7
Program direction	1	1	1	-	1

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[a] Includes a $6 million supplemental request.

Geothermal

The 17-percent increase, to $131 million, expected in the geothermal program in 1981 is primarily for expansion of the component development activity. Within this activity increases are proposed for energy conversion, geosciences, drilling and completion technology, reservoir stimulation, and geochemical engineering and materials.

R&D budget authority for geothermal energy

/Dollars in millions/

	1979 actual	1980 estimate	1981 estimate
Total	$132	$112	$131
Hydrothermal resources	53	36	42
Geopressured resources	27	36	36
Geothermal technology development	15	14	14
Component development	37	25	38
Program direction	1	1	1

Nuclear fission

R&D budget authority for nuclear fission is expected to decline from $1,014 million in 1980 to $786 million in 1981 under the revised budget estimates. This net reduction of 22 percent still reflects increased emphasis on commercial waste management but includes a large cutback in the liquid metal fast breeder reactor (LMFBR) program including the termination of the Clinch River breeder reactor and decreased emphasis on alternative reactor concepts.

The decrease of almost $11 million in thermal reactor technology in 1981 under converter reactor systems includes a decline of $25 million for the high temperature reactor because of a decision to withdraw Federal support for this program. This decrease is partially offset by proposed increases in light water reactor (LWR) uranium utilization (up $3 million), LWR occupational exposure/productivity improvement (up $7 million), and LWR safety R&D (up $5 million).

A proposed increase of $50 million in terminal isolation R&D is the chief cause of an overall increase of $58 million, or 35 percent, in 1981 in the commercial nuclear waste program. Of this increase $21 million is for site characterizations and protection of a site near Carlsbad, New Mexico in bedded salt, formerly managed under the defense nuclear waste program. Other increases will provide for expanded field investigations and technology development for non-salt geologies, as well as feasibility studies of basalt waste isolation and seabed disposal.

The decrease of $302 million in 1981 in breeder reactor systems reflects current expectations that the LMFBR will not be needed in this country until after the year 2000. Thus, the breeder reactor program will be directed to improving the LMFBR technology base, with emphasis on long-lead, critical technical problems, and on providing a basis for future decisions regarding the LMFBR option. Consistent with this policy, the 1981 budget includes a proposed reduction of $258 million for the LMFBR, including a decrease of $62 million in breeder technology and the termination of the Clinch River breeder reactor project--a reduction of $172 million. The gas cooled breeder reactor, a backup for the LMFBR, is expected to be terminated, and fuel cycle R&D will be reduced by $29 million.

Under uranium enrichment activities, an $18 million increase in 1981 in the revised budget is entirely for advanced isotope separation technology; this will permit the accelerated development of two selected uranium separation processes.

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R&D budget authority for nuclear fission

/Dollars in millions/

	1979 actual	1980 Jan. estimate	1980 Proposed reduction	1980 Revised estimate	1981 Jan. estimate	1981 Proposed reduction	1981 Revised estimate
Total	$1,006	$1,020	-$6	$1,014	$793	-$7	$786
Converter reactor system	68	63	-	63	53	-2	51
Thermal reactor technology	24	50	-	50	39	-	39
Three Mile Island examination activities	-	7[a]	-	7[a]	8	-	8
Advanced reactor systems	4	5	-	5	5	-2	3
Gas cooled thermal reactors	40	-	-	-	-	-	-
Program direction	1	1	-	1	1	-	1
Commercial nuclear waste	143	167	-	167	225	-	225
Commercial waste management	143	161	-	161	220	-	220
Terminal isolation R&D	115	143	-	143	193	-	193
Waste systems evaluation and public interaction	5	3	-	3	8	-	8
Waste treatment technology	21	14	-	14	17	-	17
Program direction	1	1	-	1	2	-	2
Remedial actions	(b)	6	-	6	5	-	5
Spent nuclear fuel storage	6	11	-	11	20	-	20
Domestic spent fuel storage	3	8	-	8	15	-	15
International spent fuel storage	3	3	-	3	4	-	14
Program direction	(b)	(b)	-	(b)	1	-	1

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nuclear fission (cont'd)	1979 actual	1980 Jan. estimate	1980 Proposed reduction	1980 Revised estimate	1981 Jan. estimate	1981 Proposed reduction	1981 Revised estimate
Advanced nuclear systems	50	38	-	38	41	-2	39
Space and terrestrial applications	38	34	-	34	37	-2	35
Advanced systems evaluation	10	2	-	2	3	-	3
Program direction	1	1	-	1	1	-	1
Breeder reactor systems	601	611	-5	606	305	-1	304
Liquid metal fast breeder reactor (LMFBR)	456	481	-	481	223	-	223
Breeder reactor studies	NA	15	-	15	8	-	8
Breeder technology	NA	142	-	142	80	-	80
Clinch River breeder reactor plant project	NA	172	-	172	-	-	-
Fast flux test facility program	NA	76	-	76	66	-	66
Test facilities	NA	75	-	75	69	-	69
Water cooled breeder reactors	51	58	-	58	60	-1	59
Gas cooled breeder reactors	21	20	-5	15	-	-	-
Fuel cycle R&D	63	41	-	41	12	-	12
Program direction	10	11	-	11	11	-	11
Light water reactor facilities	7	-	-	-	-	-	-
Uranium enrichment	131	130	-1	129	150	-3	147
Uranium enrichment activities	79	79	-	79	79	-	79
Advanced isotope separation technology	47	47	-1	46	67	-3	64
Uranium resource assessment	5	4	-	4	4	-	4

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[a] Includes a $7 million supplemental request.
[b] Less than $500,000.

Magnetic fusion

The 1981 revised budget maintains a significant increase of $41 million, or 17 percent, in support of the DOE magnetic fusion program. More than one-third of this program is devoted to confinement systems and almost one-fourth to applied plasma physics.

R&D budget authority for magnetic fusion

/Dollars in millions/

	1979 actual	1980 estimate	1981 Jan. estimate	1981 Proposed revision	1981 Revised estimate
Total	$211	$240	$286	-$5	$281
Confinement systems	69	92	105	-4	101
Tokamak systems	NA	62	72	NA	NA
Magnetic mirror systems	NA	30	33	NA	NA
Applied plasma physics	55	53	66	-	66
Advanced fusion concepts	NA	13	18	-	18
Fusion plasma theory	NA	16	21	-	21
Experimental plasma research	NA	12	16	-	16
National MFE computer network	NA	11	11	-	11
Development and technology	49	51	64	-1	63
Magnetic systems	NA	13	11	NA	NA
Plasma engineering	NA	12	16	NA	NA
Fusion reactor materials	NA	10	15	NA	NA
Fusion systems engineering	NA	12	16	NA	NA
Environment and safety	NA	2	3	NA	NA
Fusion engineering applications	NA	2	3	NA	NA
Planning and projects	36	42	49	-	49
Tokamak fusion test reactor	NA	24	23	-	23
Mirror fusion test facility	NA	9	18	-	18
Fusion materials irradiation test facility	NA	10	7	-	7
Program direction	2	3	3	-	3

Fossil energy

A proposed reduction of $90 million in the revised estimates for R&D support for fossil energy, from $743 million in 1980 to $653 million in 1981, reflects a large anticipated decrease in the coal R&D program,[a] particularly in the areas of surface coal gasification, heat engines and heat recovery, and magneto hydrodynamics.

A decline of $27 million in 1981 from the 1980 level of support for surface coal gasification is the result of completion of the design of a high-Btu synthetic pipeline gas demonstration plant (down $23 million) as well as a decrease ($7 million) in the low-Btu fuel gas utility demonstration plant project pending completion of the conceptual design.

A $7 million reduction proposed in the January budget for the heat engines and heat recovery program was primarily related to heat recovery component technology. A further reduction of $7 million proposed in March would result in a stretch-out in the technology development of dispersed power systems and a reduction in direct testing.

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[a] Funding for R&D plant is not included in this report. An increase of $344 million, to $450 million, in 1981 has been requested for R&D plant in support of the coal R&D program. The 1981 request includes funds for initiating construction of plants for solvent-refined coal and high-Btu gas demonstration.

BEST DOCUMENT AVAILABLE

R&D budget authority for fossil energy

/Dollars in millions/

		1980			1981		
	1979 actual	Jan. estimate	Proposed reduction	Revised estimate	Jan. estimate	Proposed reduction	Revised estimate
Total	$668	$767	-$24	$743	$684	-$31	$653
Coal	535	673	-18	654	592	-31	561
Mining R&D	68	69	-14	55	45	-	45
Coal liquefaction	128	170	-1	169	158	-	158
Surface coal gasification	47	100	-	100	83	-10	73
In situ coal gasification	14	10	-2	8	10	-5	5
Advanced research and technology development	40	48	-	48	53	-	53
Advanced environmental control technology	7	38	-	38	42	-	42
Heat engines and heat recovery	52	50	-	50	43	-7	36
Combustion systems	52	57[a]	-	57[a]	49	-3	46
Fuel cells	41	26	-	26	25	-5	20
Magnetohydrodynamics	77	93[b]	-	93[b]	72	-1	71
Program direction	11	11	-	11	12	-	12
Petroleum	99	59	-	59	61	-	61
Enhanced oil recovery	46	23	-	23	19	-	19
Oil shale	48	27	-	27	35	-	35
Drilling and offshore technology	3	3	-	3	2	-	2
Advanced process technology	2	6	-	6	5	-	5
Program direction	1	1	-	1	1	-	1
Gas	34	35	-5	30	30	-	30
Enhanced gas recovery	33	35	-5	30	30	-	30
Program direction	(c)	(c)	-	(c)	(c)	-	-

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[a] Includes a $6.5 million supplemental request.
[b] Includes a $17.5 million supplemental request.
[c] Less than $500,000.

Electric energy systems and storage

An increase of 9 percent, to $109 million, for this DOE program in 1981 primarily reflects increased support for battery storage programs under electric storage systems. A $3 million increase, to $5 million, is requested for the near-term batteries subprogram and $1 million increase is requested for initiation of the third generation electric vehicle subprogram.

R&D budget authority for electric energy systems and storage

/Dollars in millions/

	1979 actual	1980 estimate	1981 estimate
Total	$95	$100	$109
Electric energy systems	39	37	38
Power supply integration	15	17	19
Power delivery	23	18	18
Program direction	1	1	1
Electric storage systems	56	64	70
Battery storage	26	32	38
Thermal and mechanical storage	29	31	31
Program direction	1	1	1

Environmental R&D

The revised 1981 estimate for the DOE environmental R&D program represents an increase of only $3 million, or 1 percent, over the 1980 level. Most of the increases in environment programs proposed in the January budget were eliminated by the March budget amendments. Within the biological and environmental research program area two exceptions were a proposed increase of $5 million in 1981 for carbon dioxide and climate research and a proposed increase of $3 million in health environmental effects risk analyses, both of which were retained in the revised proposals.

R&D budget authority for environmental R&D

/Dollars in millions/

	1979 actual	1980 estimate	1981 Jan. estimate	1981 Proposed reduction	1981 Revised estimate
Total	$195	$216	$241	-$22	$219
Overview and assessment	48	54	61	-8	52
Overview management	NA	6	7	-1	6
Technology impacts	NA	20	21	-3	18
Environmental and safety engineering	NA	19	22	-3	19
Operational and environmental safety	NA	10	11	-2	10
Biological and environmental research	139	151	169	-14	155
Human health studies	NA	27	30	-3	28
Health effects research in biological systems	NA	47	51	-4	47
Environmental studies	NA	35	36	-4	32
Physical and technological studies	NA	31	34	-3	31
Carbon dioxide and climate research	NA	9	14	(a)	14
Health environmental effects risk analysis	NA	1	5	(a)	4
Program direction	8	10	11	-	11

[a] Less than $500,000.

Supporting research

An increase of $39 million, or 18 percent, is proposed in the revised budget estimate for DOE supporting research compared with the 25 percent increase recommended in January. The 16-percent growth proposed in the revised estimate for basic energy sciences primarily covers basic research support to advance understanding of fundamental phenomena underlying all energy technologies. A reduction of $6 million in the Janury 1981 estimate for technical assessment projects reflects the postponement of further work on satellite power systems.

R&D budget authority for supporting research

/Dollars in millions/

	1979 actual	1980 estimate	1981 Jan. estimate	1981 Proposed reduction	1981 Revised estimate
Total	$192	$220	$274	-$16	$259
Basic energy sciences	173	198	237	-7	230
Nuclear science	28	31	33	-	33
Low-energy nuclear science	NA	23	25	-	25
Isotope preparation	NA	8	9	-	9
Materials science	72	79	92	-2	90
Metallurgy and ceramics	NA	35	41	NA	NA
Solid state physics	NA	33	39	NA	NA
Materials chemistry	NA	11	13	NA	NA
Chemical sciences	48	55	63	-2	61
Fundamental interactions	NA	33	38	NA	NA
Processes and techniques	NA	23	26	NA	NA
Engineering, mathematical and geosciences	16	20	29	-2	27
Engineering research	NA	2	4	NA	NA
Applied mathematical sciences	NA	10	13	NA	NA
Geosciences	NA	8	12	NA	NA
Advanced energy projects	4	5	8	-1	7
Biological energy research	4	6	9	-1	8
Program direction	2	2	2	-	2
Technical assessment projects	11	13	21	-6	16
University research support	6	7	14	-3	11
Technical program and policy analysis	1	2	2	-	2

Energy conservation

R&D funding for energy conservation has increased significantly over the past several years, but the proposed level in 1981 shows an increase of only $3 million, or 1 percent, over the revised 1980 level. Increased incentives now exist for additional private investment in improved energy-efficient technologies. A decline of $8 million in technology and consumer products under buildings and community systems reflects the termination of the 40KW fuel cell field test program. The only significant proposed increase in energy conservation is $11 million for a new energy conversion technology program in the multisector area.

R&D budget authority for energy conservation

/Dollars in millions/

		1980			
	1979 actual	Jan. estimate	Proposed reduction	Revised estimate	1981 estimate
Total	$226	$295	-$4	$291	$294
Buildings and community systems...	78	103	-	103	96
Buildings systems	18	17	-	17	20
Appliance standards	5	6	-	6	8
Community systems	19	17	-	17	16
Urban waste	9	13	-	13	10
Technology and consumer products	20	30	-	30	22
Analysis and technology transfer	3	5	-	5	6
Residential conservation service	-	5	-	5	5
Federal energy management program	1	(a)	-	(a)	3
Small business	1	1	-	1	1
Emergency buildings temperature restriction program	-	4	-	4	-
Program direction	4	5	-	5	6
Industrial energy conservation ...	39	60	-	60	58
Waste energy reduction	15	16	-	16	20
Industrial process efficiency...	14	21	-	21	19
Industrial cogeneration	5	11	-	11	12
Implementation and deployment...	3	10	-	10	5
Program direction	2	2	-	2	3
Transportation energy conservation	98	115	-4	111	112
Vehicle propulsion RD&D	46	60	-	60	55
Electric and hybrid vehicle RD&D	38	41	-4	37	42
Transportation systems utilization	6	7	-	7	7
Alternative fuels utilization ..	6	5	-	5	4
Program direction	2	3	-	3	3
Multisector	10	17	-	17	29
Appropriate technology	8	12	-	12	14
Invention program	2	4	-	4	3
Energy conversion technology ...	-	-	-	-	11
Personnel resources	(a)	1	-	1	1

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[a] Less than $500,000.

Nuclear Regulatory Commission

The R&D program of NRC shows an increase of $24 million, or 12 percent, in 1981. All NRC program areas are expected to increase significantly with the exception of reactor safety research. The funding level for this program is virtually unchanged because of proposed termination of the advanced reactor safety research program. Fast breeder reactors and advanced converter reactors have been the focus of this program. This action is in concert with administration policy on advanced reactor development and is consistent with the DOE plan for 1981.

R&D budget authority for the Nuclear Regulatory Commission

[Dollars in millions]

	1979 actual	1980 estimate	1981 estimate
Total	$157	$204[a]	$228
Reactor safety research	118	158	159
Light water reactor safety research	94	132	137
Systems engineering	32	41	38
LOFT	23	42	43
Code development	9	12	14
Fuel behavior	21	28	28
Primary systems engineering	8	9	14
Seismic, engineering and site research	8	10	17
Advanced reactor safety research program	15	15	5
Environmental effects and fuel cycle safety	8	7	12
Waste management	4	9	14
Safeguards research	5	4	5
Risk assessment	4	9	13
Improved reactor safety	1	1	5
Program technical support	17	17	21

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[a] Includes a $24 million supplemental request.

Environmental Protection Agency

The energy R&D program under EPA is expected to increase $6 million, or 6 percent, in 1981. This increase is primarily for fuel processing, preparation, and advanced combustion. Additional support will be provided for characterizing emission and effluents and for evaluating pollution control methods for the commercialization of an environmentally acceptable synthetic fuel industry.

R&D budget authority for the energy R&D program of the Environmental Protection Agency

/Dollars in millions/

	1979 actual	1980 estimate	1981 estimate
Total	$113	$101	$108
Fuel processing, preparation, and advanced combustion	13	13	19
Fuel extraction	4	3	3
Environmental assessment of conventional and advanced energy systems	17	13	12
Flue gas sulphur oxide control	3	2	4
Nitrogen oxide control	14	14	12
Flue gas particulate control	9	8	8
Transportation, fate, and effects of energy-related pollutants	16	15	15
Atmospheric transport and transportation of energy-related pollutants	9	7	8
Measurement systems and instrumentation development for energy-related pollutants	8	8	9
Health effects of energy-related pollutants	20	18	18

Energy security trust fund (ESTF)

The ESTF will consist of the amounts collected from the windfall profits tax on domestic crude oil production, reduced by amounts equal to the tax expenditures associated with energy-related tax credits enacted after May 1979. The January budget included a request for $50 million from the ESTF in both 1980 and 1981 for coal R&D programs to aid in development of technology for large-scale production of synfuels. These amounts were reduced in the revised budget estimates to $15 million in 1980 and $27 million in 1981.

GENERAL SCIENCE

The programs that fall within the general science area are viewed as contributing to the Nation's scientific base in the broadest sense. While many other Federal science programs also have farreaching effects, they are designed in the first place to support specific agency missions like national defense, health, or space exploration. The programs that are subsumed within the general science function are sponsored by two agencies: the National Science Foundation (NSF) and the Department of Energy (DOE). All the NSF programs and three DOE programs are included.

Total R&D budget authority proposed for this function in 1981 is $1,371 million, down $64 million, or 4 percent, from the $1,435 million proposed in January. The revised estimate reduces the relative increase over 1980 from 15 percent to 10 percent. The chief changes now shown in 1981 in R&D funding are as follows:

- o An increase of $90 million, or 10 percent, in NSF R&D programs with a significant gain shown in mathematical and physical sciences and high relative gains shown in cross-directorate and ocean drilling programs despite budget amendements.
- o Cross-directorate programs of NSF are cut by $22 million from the January level, including $14 million for the entire university research facilities improvement program, a 1981 initiative.
- o Ocean drilling activities of NSF are cut $5 million, stretching out the design period for the ocean margin drilling project.
- o The NSF engineering and applied science program is cut $17 million from the January estimate, chiefly by elimination of the integrated basic research program and halving of the small business innovation program.
- o NSF basic research is cut by $49 million, making the relative 1980-81 increase 11 percent, compared with 17 percent in the January budget.
- o An increase of $35 million, or 10 percent, from 1980 to 1981 is shown in DOE research programs, including a $22 million increase for high-energy physics.

Within the general science function 86 percent of the total budget authority in 1981 consists of R&D programs, most of them devoted to the conduct of basic research. Other programs within this function consist of support of R&D plant for both NSF and DOE and non-R&D science education, international, and data collection programs of NSF.

R&D budget authority for general science

/Dollars in millions/

	1979 actual	1980 estimate	1981 Jan. estimate	1981 Proposed reduction	1981 Revised estimate
Total	$1,119	$1,246	$1,435	-$64	$1,371
National Science Foundation	810	904	1,059	-64	994
Mathematical and physical sciences	201	225	263	-4	258
Astronomical, atmospheric, earth, and ocean sciences	200	215	242	-6	237
Biological, behavioral, and social sciences	157	171	187	-4	183
Engineering and applied science	106	117	142	-17	125
U.S. Antarctic research program	47	52	58	-2	57
Scientific, technological, and international affairs	26	29	32	-1	31
Cross-directorate programs	12	25	51	-22	29
Ocean drilling programs	12	19	27	-5	22
Science education	17	19	22	-2	21
Special foreign currency program	4	6	6	-	6
Program development and management	26	26	29	-1	28
Department of Energy	309	342	377	-	377
High-energy physics	195	220	242	-	242
Nuclear physics	75	82	89	-	89
Life sciences and nuclear medicine applications	40	41	46	-	46

National Science Foundation

The mathematical and physical sciences (MPS) program reflects a 15-percent increase in 1981, or $34 million, after proposed budget amendments. An overall $4 million cutback affects all major program areas but still allows for high relative growth, from 14 percent to 17 percent, in individual disciplines. The amendments include reductions in amounts proposed for instrumentation and equipment in physics, chemistry, and materials research but retain the original emphasis on reestablishing a healthy experimental capability in computer science.

R&D budget authority for mathematical and physical sciences

/Dollars in millions/

	1979 actual	1980 estimate	1981 Jan. estimate	1981 Proposed reduction	1981 Revised estimate
Total	$201	$225	$263	-$4	$258
Mathematical sciences	23	25	29	-1	29
Computer research	17	18	21	-1	21
Physics	54	60	71	-1	70
Chemistry	45	51	59	-1	58
Materials research	59	66	77	-1	76
Program development and management.	4	5	5	-	5

The astronomical, atmospheric, earth, and ocean sciences (AAEO) program area shows a 10 percent increase, or $22 million, in 1981 over 1980 after proposed budget amendments, compared with a 13 percent increase in the January budget. Growth of $6 million, or 13 percent, is seen in the astronomical sciences where the cutback involves only the elimination of funds for detailed design of a 25-meter millimeter wave telescope. Growth of $7 million, or 11 percent, is planned for ocean sciences, but here the effect of reductions would be compounded by increases in fuel costs for oceanographic research ships, which could result in ship layups, reallocation of funds from research to ship operations, and elimination of some individual investigator research projects. An increase of $6 million in atmospheric sciences allows for 10-percent growth but precludes research on various layers of the atmosphere and some computer analysis because of 1981 cutbacks. An increase of $2 million for earth sciences allows for 8-percent growth, but the budget revision eliminates support for a number of proposals that would affect young investigators.

R&D budget authority for astronomical, atmospheric, earth, and ocean sciences

/Dollars in millions/

	1979 actual	1980 estimate	1981 Jan. estimate	1981 Proposed reduction	1981 Revised estimate
Total	$200	$215	$242	-$6	$237
Astronomical sciences	48	52	60	-1	59
Astronomy project support	16	18	19	-	19
National Astronomy and Ionosphere Center	5	5	5	-	5
Kitt Peak National Observatory	10	11	12	-	12
Cerro Tololo Inter-American Observatory	4	5	5	-	5
National Radio Astronomy Observatory	11	13	17	-1	16
Sacramento Peak Observatory	2	2	2	-	2
Atmospheric sciences	58	62	70	-2	68
Atmospheric sciences project support[a]	32	34	39	-1	38
National Center for Atmospheric Research	24	26	29	-1	28
National Scientific Balloon Facility	2	2	3	(b)	3
Earth sciences	25	25	28	-1	27
Ocean sciences	59	64	72	-2	71
Oceanography project support	20	21	25	-1	24
Coordinated ocean research and exploration[c]	19	21	24	-1	23
Oceanographic facilities and support	20	23	24	-1	24
Arctic research programs	6	6	6	(b)	6
Program development and management	5	6	6	-	6

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[a] Covers all university grant programs, including the Climate Dynamics Program and the Global Atmospheric Research Program.

[b] Less than $500,000.

[c] The International Decade of Ocean Exploration (IDOE) is succeeded by this program element in 1981. FY 1979 and FY 1980 IDOE funding is included in this line.

The biological, behavioral, and social sciences (BBS) area reflects a 7-percent increase in 1981 over 1980, or $11 million. Before the proposed budget amendments BBS showed an increase of 9 percent. All divisions are affected by the cutbacks, and with the level of effort reduced in real terms the emphasis will be on maintenance of core support. Physiology, cellular and molecular biology is now scheduled for a $6 million increase, or 9 percent, with a reduction in the development of advanced instrumentation that was previously planned. Behavioral and neural sciences, up $2 million, or 7 percent, also reflects the curtailment of instrumentation work plus deferment of certain anthropology projects and reduction of planned research in cognitive and behavioral sciences. Social and economic science shows an increase of only $1 million, or 4 percent. Environmental biology shows a gain of $2 million, or 6 percent, with cutbacks in ecosystems studies and curtailment of response capacity in tropical biology areas.

R&D budget authority for biological, behavioral, and social sciences

/Dollars in millions/

	1979 actual	1980 estimate	1981 Jan. estimate	1981 Proposed reduction	1981 Revised estimate
Total	$157	$171	$187	-$4	$183
Physiology, cellular and molecular biology	62	67	75	-2	73
Behavioral and neural sciences ...	33	35	39	-1	38
Social and economic science	25	26	28	-1	27
Environmental biology	34	38	41	-1	40
Program development and management	4	5	5	-	5

The engineering and applied science (EAS) program area shows an increase of $8 million, or 7 percent, for 1981 after proposed budget amendments reduced the request by $17 million. The January budget proposed an increase of 22 percent over 1980. The engineering portion of EAS was reduced by slightly more than $1 million while the remaining portion was reduced by $16 million. The plan was to sustain core research programs in engineering and to create minimum disruption of other ongoing activities.

R&D budget authority for engineering and applied science

/Dollars in millions/

	1979 actual	1980 estimate	1981 Jan. estimate	1981 Proposed reduction	1981 Revised estimate
Total	$106	$117	$142	-$17	$125
Electrical, computer, and systems engineering	17	17	22	-1	22
Chemical and process engineering ..	13	14	17	(a)	16
Civil and environmental engineering	8	9	10	(a)	10
Mechanical sciences and engineering	10	12	13	(a)	13
Applied research	14	17	18	-	18
Applied social and behavioral sciences	6	9	9	-	9
Applied physical, mathematical, and biological sciences and engineering	8	9	9	-	9
Problem-focused research	29	29	31	-6	25
Earthquake hazards mitigation	16	18	19	-	19
Chemical threats to man and environment	1	-	-	-	-
Alternative biological sources of materials	3	3	3	(a)	3
Community water management	(a)	-	-	-	-
Science and technology to aid the handicapped	1	2	2	-1	1
Human nutrition	1	1	1	(a)	1
Integrated basic research	5	4	5	-5	-
Problem analysis	1	1	1	(a)	(a)
Intergovernmental	5	6	7	-1	6
Small business innovation and industrial technology	6	7	18	-9	9
Program development and management..	5	6	6	-	6

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[a] Less than $500,000.

Within the broad engineering program electrical, computer, and systems engineering shows an increase of 24 percent over 1980, or $4 million after amendments, and chemical and process engineering shows an increase of 18 percent, or $2 million. The increase for civil and environmental engineering is 7 percent, or $1 million, and for mechanical sciences and engineering, 12 percent, or $1 million.

The applied research program reflects an increase of $1 million, or 7 percent. No budget amendments were proposed.

Within the problem-focused research area a decrease of $6 million, or 14 percent, is now planned. This compares with an increase of 6 percent proposed in January. The earthquake hazards mitigation program, which makes up almost 80 percent of the problem-focused activity, shows an increase of 8 percent. No budget amendments were proposed. The chief cause of the reduction in the problem-focused area is the proposed elimination of the integrated basic research program -- a reduction of $5 million. The science and technology to aid the handicapped program is reduced by one-third under the proposed amendments. Other program areas show reductions -- the main one for research on alternative biological sources of materials.

The intergovernmental program was reduced by $1 million in the proposed amendments with the entire reduction directed at the State science, engineering, and technology (SSET) program.

Within the small business innovation and industrial technology activity a $9 million reduction in the original amount proposed for 1981 now allows for an increase of 25 percent instead of 150 percent, as planned in January. The chief reduction would be in Phase II awards -- those projects judged most promising after Phase I screening.

The U.S. Antarctic research program shows an increase of $5 million, or 9 percent, in 1981 after budget amendments. Most of the reduction is in the operations support program relating to the Antarctic research station and flight hours. A reduction of less than $1 million in the research program would mean fewer awards for field experiments in the five scientific disciplines involved -- atmospheric, biological, and earth sciences, glaciology, and oceanography.

R&D budget authority U.S. Antarctic research program

[Dollars in millions]

			1981		
	1979 actual	1980 estimate	Jan. estimate	Proposed reduction	Revised estimate
Total	$47	$52	$58	-$2	$57
Research program	7	8	9	-1	8
Operations support program ..	41	44	49	-1	48

Scientific, technological, and international affairs (STIA) research shows an increase of $1 million, or 5 percent, in the revised 1981 budget. In the January proposal the increase over 1980 was 9 percent. All programs stay at levels not much higher than 1980. The reduction in the original plan for international cooperative scientific activities will be applied to U.S./U.S.S.R. scientist exchanges.

R&D budget authority for scientific, technological, and international affairs

[Dollars in millions]

	1979 actual	1980 estimate	1981 Jan. estimate	1981 Proposed reduction	1981 Revised estimate
Total	$26	$29	$32	-$1	$31
International cooperative scientific activities	10	12	13	(a)	13
Policy research and analysis	5	6	7	(a)	6
Science resources studies	3	3	3	(a)	3
Information science and technology..	1	2	2	(a)	2
Program development and management..	6	7	7	-	7

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[a] Less than $500,000.

Cross-directorate programs are expected to increase by $4 million, or 15 percent, in 1981 after budget amendments. This growth compares with a 100-percent increase anticipated in January. The $22 million proposed reduction is largely the result of a proposed decrease of $14 million for the university research facilities improvement program, which was the total planned for this program in 1981. The $6 million remaining in the special facilities and instrumentation activity covers support for 2-year and 4-year college instrumentation and regional instrumentation facilities.

For industry/university cooperative research a $5 million reduction still allows for a doubling of the program over 1980. The reduction would slow projected expansion of cooperative activities between scientists in the unversity and industrial sectors.

For cross-directorate international programs a $3 million reduction would represent a 41-percent decrease from the 1980 level. The reduction covers certain exchanges of scientific information and expertise between the United States and the U.S.S.R.

R&D budget authority for cross-directorate programs

/Dollars in millions/

	1979 actual	1980 estimate	1981 Jan. estimate	1981 Proposed reduction	1981 Revised estimate
Total	$12	$25	$51	-$22	$29
Industry/university cooperative research	2	7	20	-5	15
Special facilities and instrumentation programs	6	8	20	-14	6
Cross-directorate international programs	3	4	5	-3	3
Other programs	2	6	6	(a)	6

[a] Less than $500,000.

The *ocean drilling* activity is expected to increase $3 million, or 19 percent, after budget amendments. Without the reductions the increase would have been 40 percent. This activity consists of (1) the deep sea drilling project, almost 80 percent of the total activity in the revised 1981 budget, and (2) the ocean margin drilling project, more than 20 percent of the total.

The deep sea drilling project, in operation since 1968, is now in the international phase with five foreign countries contributing to the program. The drilling ship, *Glomar Challenger*, is used for general reconnaissance of the makeup of the earth's crust beneath the oceans. The reduction in 1981 is less than $500 thousand and applies to all activities. The expected increase over 1980 is 7 percent.

The ocean margin drilling project, now in the design stage, represents a transition to a problem-focused approach, currently aimed at an extensive investigation of the ocean margins. The *Glomar Explorer*, formerly owned by the Navy, will be converted to a research ship. The $5 million reduction in funding in 1981 stretches out the design period for conversion and reduces the 1981 increase to 39 percent.

R&D budget authority for ocean drilling programs[a]

/Dollars in millions/

	1979 actual	1980 estimate	1981		
			Jan. estimate	Proposed reduction	Revised estimate
Total	$12	$19	$27	-$5	$22
Deep sea drilling project	11	16	17	(b)	17
Ocean margin drilling project..	1	4	10	-5	5

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[a] Formerly the Ocean Sediment Coring Program within earth sciences, consisting of deep sea drilling and ocean margin drilling.

[b] Less than $500,000.

Science education R&D programs are expected to increase $2 million, or 11 percent, after a 1981 budget amendment. Development in science education is expected to grow 26 percent, covering materials and techniques for effective teaching of science. Research in science education, on how science is learned, is expected to decline 2 percent. The ethics and values program is expected to increase 5 percent.

R&D budget authority for science education

/Dollars in millions/

	1979 actual	1980 estimate	1981 Jan. estimate	1981 Proposed reduction	1981 Revised estimate
Total	$17	$19	$22	-$2	$21
Science education development and research	12	14	18	-2	16
Development in science education	8	8	11	-1	10
Research in science education	4	6	7	-1	6
Science and society: Ethics and values	1	1	1	-	1
Program development and management	4	4	4	-	4

The remaining NSF R&D funding covers the special foreign currency program, executive management, and central support services and administration.

Department of Energy

The DOE general science and research appropriation covers three basic sciences programs: high-energy physics, nuclear physics, and life sciences research and nuclear medicine applications. The total program is proposed for a $34 million, or 10-percent, increase in 1981. No reductions were made in the amounts shown in the January budget for either 1980 or 1981.

High-energy physics is by far the largest program since it uses large accelerator facilities to study the energy/matter interactions resulting from collisions of high-energy particles with fixed targets or other particle or antiparticle beams. The goal is to understand the properties of the most basic constituent building blocks of matter to unify the four known basic forces into a single, comprehensive theoretical framework. In 1981 an increase of $23 million, or 10 percent, is sought to maintain a productive research program which provides for a nearly constant level of effort. A major feature of the 1981 program is an increase of $4 million to operate the first full year of the positron-electron project (PEP) at the Stanford Linear Accelerator Center (SLAC). The levels shown in this analysis omit R&D plant requests; in the case of high-energy physics R&D plant costs are a proposed $117 million in 1981, up $11 million over 1980, for construction and capital equipment for the three high-energy accelerators.

Nuclear physics is expected to receive an increase of $7 million, or 9 percent, in 1981. The long-range goal of this program is to attain a fundamental understanding of the interactions, properties, and structure of nuclei by means of research at major particle accelerator facilities. Work is grouped under medium energy and heavy ion nuclear physics and nuclear theory.

Life sciences research and nuclear medicine applications is expected to increase by $5 million, or 12 percent, in 1981. The general life sciences program provides the basis for estimating the risk to human health and impacts on environmental systems of energy-related activities. The nuclear medicine R&D program is directed toward new applications of radiation and radioactive isotopes for the diagnosis and treatment of human diseases and the transfer of nuclear technology to clinical medicine.

R&D budget authority for Department of Energy general science programs

/Dollars in millions/

	1979 actual	1980 estimate	1981 estimate
Total	$309	$342	$377
High-energy physics	195	220	242
Physics research	63	69	77
Facility operations	92	104	114
High-energy physics technology	39	47	51
Program direction	1	1	1
Nuclear physics	75	82	89
Medium-energy nuclear physics	38	42	46
Heavy ion nuclear physics	31	34	36
Nuclear theory	6	6	7
Program direction	(a)	(a)	(a)
Life sciences research and nuclear medicine applications	40	41	46
General life sciences	23	23	26
Nuclear medicine applications	16	18	20
Program direction	(a)	(a)	(a)

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[a] Less than $500,000.

Basic Research: All Functions

In the January budget the administration continued an established policy of providing real growth for basic research funding. The relative increase in budget authority for 1981 over 1980 was 12 percent, bringing the total to $5.1 billion. After proposed recissions for 1980 and proposed budget amendments for 1981 the relative increase is 8 percent with the revised total now $4.9 billion. Largest cutbacks were made in space and general science programs.

Budget authority for basic research by function

/Dollars in millions/

	1979 actual	1980 Jan. estimate	1980 Proposed reduction	1980 Revised estimate	1981 Jan. estimate	1981 Proposed reduction	1981 Revised estimate
Total	$4,108	$4,527	-$16	$4,511	$5,068	-$192	$4,876
General science	1,026	1,138	-	1,138	1,309	-49	1,259
National Science Foundation..	733	814	-	814	951	-49	902
Department of Energy	293	324	-	324	357	-	357
All other functions	3,082	3,389	-16	3,373	3,760	-143	3,617
Health	1,579	1,724	-13	1,711	1,831	-36	1,795
National defense	365	441	-2	439	533	-15	518
Space research and technology	440	454	-	454	490	-61	429
Agriculture	222	245	-1	244	277	-3	274
Energy	172	198	-	198	236	-7	229
Natural resources and envmt..	131	139	-	139	152	-	152
Transportation	75	85	-	85	113	-8	105
Education, training, employment, and social services	59	62	-	62	73	-8	65
Commerce and housing credit..	10	12	-	12	20	-5	15
Community and regional development	8	8	-	8	13	-	13
Veterans benefits and services	10	10	-	10	11	-	11
Administration of justice ...	10	10	-	10	10	-	10
Income security	1	1	-	1	1	-	1
General government	(a)	(a)	-	(a)	(a)	-	(a)
International affairs	-	-	-	-	-	-	-

[a] Less than $500,000.

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The general science function accounts for one-fourth of all Federal basic research support. The 15-percent increase planned in January has been reduced to an 11-percent increase. The proposed amendment is entirely directed at NSF programs, which are reduced by $49 million and their relative increase, from 17 percent to 11 percent.

The health function, which accounts for almost two-fifths of the total Federal basic research effort, was not expected to show real growth in the January budget. Most basic research is sponsored by the National Institutes of Health (HHS), and the amounts proposed for the institutes resulted in a 6-percent increase for health in 1981. This has subsequently been reduced to 5 percent.

National defense is now third in amount of funding for basic research. In this case a proposed increase of $92 million in 1981 has been reduced to $79 million and relative growth from 21 percent to 18 percent. The chief impetus behind this increase is a recognized need to build DOD technology base programs

The space research and technology function reflects the largest cut in the proposed 1981 amendments. Even in January the increase of $36 million in NASA space science and other basic research programs was just 8 percent over the 1980 level. With a reduction of $61 million, these programs now show a decline of almost 6 percent.

The agriculture function, by contrast, is still expected to show real growth in basic research support. After small reductions in earlier plans, an increase of $30 million would produce a 12-percent gain for USDA programs within this function.

Energy, also, is expected to show real growth in basic research support in 1981. An original 19-percent increase has been changed to a 16-percent increase by proposed budget amendments. All the programs here are sponsored by DOE.

Within the natural resources and environment function an increase of 9 percent in basic research support is shown. No budget amendments were proposed. Most basic research is sponsored by the Geological Survey (Interior) and the rest by the Forest Service (USDA).

The remaining functions account for only 5 percent of all Federal basic research funding in the 1981 budget, as amended.

NATURAL RESOURCES AND ENVIRONMENT

R&D budget authority in 1981 for natural resources and environment, as revised, shows an increase of $50 million, or 5 percent, over the 1980 level. The major changes proposed for this function in 1981 are as follows:

- An increase of 9 percent, to $152 million, in basic research.
- An increase of 10 percent for conservation and land management, reflecting planned expansion in R&D programs of the Forest Service within the Department of Agriculture (USDA).
- An increase of 7 percent in R&D programs of the Environmental Protection Agency (EPA) related to pollution control and abatement. The most significant proposed increases are for the solid waste program (up 86 percent) and the toxic substances research program (up 32 percent).

R&D budget authority for natural resources and environment as a share of total Federal budget authority for this function is estimated at 8.9 percent in 1980 and 9.1 percent in 1981.

R&D budget authority for natural resources and environment

/Dollars in millions/

	1979 actual	1980 estimate	1981		
			Jan. estimate	Proposed reduction	Revised estimate
Total	$1,010	$1,090	$1,144	-$4	$1,140
Water resources	65	73	79	(a)	79
Water and Power Resources Services (Int)	12	13	15	-	15
Office of Water Research and Technology (Int)	28	30	32	(a)	32
Corps of Engineers (DOD)	26	30	32	-	32
Conservation and land management	117	122	136	-1	134
Forest Service (USDA)	111	112	126	-1	124
Bureau of Land Management (Int)	1	2	2	-	2
Office of Surface Mining and Reclamation (Int)	5	8	8	-	8
Recreational resources	89	91	93	-	93
Fish and Wildlife Service (Int)	81	84	85	-	85
National Park Service (Int)	8	7	8	-	8
Pollution control and abatement	283	337	361	-	361
Environmental Protection Agency	283	337[b]	361	-	361
Other natural resources	455	467	475	-3	473
National Oceanic and Atmospheric Adm. (Commerce)	182	205	210	-	210
Geological Survey (Int)	146	153	154	-3	151
Bureau of Mines (Int)	125	106	110	-	110
Office of the Secretary (Int)	3	3	2	-	2

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[a] Less than $500,000.
[b] Includes a $5.6 million supplemental request.

Water resources

An increase of 8 percent in 1981 planned for water resources R&D is evenly spread among the three agencies involved, the Water and Power Resources Service (formerly the Bureau of Reclamation) and the Office of Water Research and Technology, both under the Department of the Interior, and the Army Corps of Engineers (DOD). Water resources accounts for 7 percent of the R&D total for natural resources and environment.

Conservation and land management

Conservation and land management represents an estimated 12 percent of the function R&D total in 1981. A proposed increase (revised) of $12 million for R&D activities in this area reflects expansion in programs of the Forest Service (USDA). Of this increase, $5 million for land and resource protection research provides for research on eastern hardwoods, softwood timber supply, integrated pest management, and surface mineland rehabilitation. A $7 million increase for renewable resources management and utilization programs provides for additional support for eastern hardwoods and softwood timber supply research as well as for rangeland research.

R&D budget authority for the Forest Service (USDA)

/Dollars in millions/

			1981		
	1979 actual	1980 estimate	Jan. estimate	Proposed reduction	Revised estimate
Total	$111	$112	$126	-$1	$124
Land and resource protection research	53	53	58	-1	57
Fire and atmospheric research	10	10	10	(a)	10
Forest insects and disease	21	22	24	(a)	24
Renewable resources evaluation	14	14	15	(a)	15
Renewable resources economics research	5	5	6	-	6
Surface environment and mining	3	2	2	-	2
Renewable resources management and utilization programs	58	60	68	-1	67
Trees and timber management research	20	21	24	(a)	23
Forest watershed management research	10	10	10	(a)	10
Wildlife, range, and fish habitat research	9	9	10	(a)	10
Forest recreation research	3	2	2	-	2
Forest products utilization research	14	15	18	(a)	18
Forest engineering research	2	2	3	-	3

Recreational resources

Recreational resources represent an estimated 8 percent of the R&D portion of the function in 1981. No significant changes are proposed for this activity, which is primarily carried out by the Fish and Wildlife Service of the Department of the Interior.

R&D budget authority for the Fish and Wildlife Service (Interior)

/Dollars in millions/

	1979 actual	1980 estimate	1981 estimate
Total	$81	$84	$85
Resource management	42	42	43
Habitat preservation	18	19	19
Wildlife resources	12	12	12
Fishery resources	11	10	11
Endangered species	2	2	1
Federal aid, fish restoration	17	19	20
Federal aid, wildlife restoration	22	22	22

Pollution control and abatement

This subfunction accounts for approximately 32 percent of the R&D total of natural resources and environment. All programs are conducted by EPA. The proposed net increase of $24 million for R&D activities related to pollution control and abatement chiefly reflects expansion of the EPA hazardous waste program within the solid waste activity and the EPA toxic substances research program.

R&D budget authority for the Environmental Protection Agency[a]

/Dollars in millions/

	1979 actual	1980 estimate	1981 estimate
Total	$283	$337	$361
Programs funded by the EPA R&D and S&E appropriations[a]	208	264	287
Air	50	67	71
Health and ecological effects	29	42	45
Transportation sources	6	6	7
Health effects/criteria pollutants	2	6	7
Health effects/non-criteria pollutants	10	15	16
Ecological effects	1	2	2
Transportation and fate of pollutants	11	13	13
Industrial processes	4	4	4
Monitoring and technical support	18	21	21
Water quality	63	65	60
Health and ecological effects	22	24	22
Health effects	6	7	7
Transport and fate	1	1	1
Chesapeake Bay	2	3	3
Great Lakes	3	4	2
Marine ecological effects	3	4	3
Freshwater ecological effects	7	5	6
Industrial processes	10	14	11
Public sector activities	21	15	15
Wastewater control technology	14	7	7
Urban toxics and residuals management	7	8	8

	1979 actual	1980 estimate	1981 estimate
Water quality (cont'd)			
Monitoring and technical support	10	12	12
Drinking water	16	23	27
Public sector activities	16	22	26
Health effects	6	12	12
Treatment and groundwater protection	10	10	14
Monitoring and technical support	1	1	1
Solid waste: public sector activities	7	14[b]	26
Pesticides	12	13	9
Health and ecological effects	8	9	6
Health effects	5	6	3
Ecological effects	3	3	2
Exposure assessment	-	-	1
Industrial processes: integrated pest management	4	4	3
Monitoring and technical support	(c)	1	1
Radiation	2	3	3
Interdisciplinary	19	23	23
Health and ecological effects	7	5	5
Anticipatory research	9	15	15
Monitoring and technical support	3	3	3
Toxic substances	16	28	37
Health and ecological effects	14	24	32
Health effects	10	13	16
Ecological effects	1	7	11
Transport and fate	2	2	3
Stratospheric modification	1	1	1
Industrial processes	(c)	2	2
Monitoring and technical support	2	3	3
Management and support	24	28	29
Programs funded under the abatement, control, and compliance appropriation	73	73	73
Special foreign currency program	3	-	1

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[a] Excludes energy-related R&D programs.

[b] Includes a $5.6 million supplemental request.

[c] Less than $500,000.

- A decrease of $5 million for water quality programs is proposed in-1981. A reduction of $2 million in the Great Lakes program reflects decreased emphasis on assessments of the transport and fate of persistent toxic organic chemicals present in the Great Lakes. A decrease of $3 million in industrial processes primarily stems from discontinuation of extramural work directed at (1) quantifying the effectiveness of existing agricultural test management practices (MP's) toward reducing nutrient, pesticide, and other pollutant contributions to receiving waters, and (2) evaluating techniques for selecting BMP's to improve receiving water quality.

- A $4 million proposed increase for drinking water programs is mostly to fund an initiative to aid small communities in meeting national drinking water standards.

- Significant growth, of 86 percent, is proposed for the solid waste program in 1981. The $12 million net increase consists of (1) $4 million for development of hazardous waste monitoring and measurement methods and quality assurances, (2) $6 million to expand research needed to provide data and guidance manuals on thermal destruction of hazardous waste, (3) almost $3 million to increase work on the development of technologies to remedy effects of uncontrolled hazardous waste dumpsites, (4) $3 million to document the health risks associated with hazardous waste sites, and (5) a partially offsetting decrease of more than $3 million, reflecting the phaseout of work on municipal solid waste disposal, resource recovery from municipal waste, and large-scale waste characterization.

- A $3 million reduction in health effects research within the pesticides activity reflects the shifting of resources to toxic substance health activities and a desire to strengthen exposure assessment activities outside the health research area. Despite a $1 million reduction in integrated pest management (IPM), no reduction will occur in research performed since the work will be carried out by the 15-University IPM Consortium with funding by both EPA and the USDA Science and Education Administration.

- An increase of $9 million, or 32 percent, is proposed for toxic substances programs in 1981. With these additional funds EPA would accelerate the development of research techniques for screening toxic substances. Further research would be conducted in predicting, measuring, and determining the significance of exposure to commercial chemicals.

Other natural resources

No significant funding changes are proposed for other natural resources programs. These represent approximately 42 percent of the R&D total for natural resources and environment. However, the budget request for the National Oceanic and Atmospheric Administration (Commerce) includes $6 million in 1981 to initiate the national oceanic satellite system. Almost no change is shown in funding levels for the Geological Survey (Interior).

R&D budget authority for the National Oceanic and Atmospheric Admin. (Commerce)

[Dollars in millions]

	1979 actual	1980 estimate	1981 estimate
Total	$182	$205	$210
Mapping, charting, and surveying services	6	8	8
Ocean fisheries and living marine resources	61	65	63
Marine resources assessment, monitoring and predictions	26	26	30
Conserving marine resources	12	13	14
Restoring and increasing fishery resources	8	9	7
Managing and using fishery resources	16	17	12
Marine ecosystems investigations	15	17	17
Marine technology	11	12	15
Sea grants	21	24	24
Basic environmental services	18	22	23
Environmental satellite service	8	8	7
Public forecast and warning services	12	13	16
Specialized environmental services	6	7	7
Global monitoring of climate change	2	4	4
Weather modification	7	8	8
International projects	9	9	9
Executive direction and administration	7	8	9

R&D budget authority for the Geological Survey (Interior)

/Dollars in millions/

	1979 actual	1980 estimate	1981 Jan. estimate	1981 Proposed reduction	1981 Revised estimate
Total	$146	$153	$154	-$3	$151
Topographic surveys and mapping	8	11	11	-1	10
Research on mapping technology	3	3	4	(a)	3
Research on land use mapping techniques and analysis	3	3	3	-	3
Research related to the airborne positioning system	2	4	4	1	3
Geologic and mineral resources surveys and mapping	101	103	104	-1	103
Earthquake hazards reduction	25	25	25	-	25
Other geologic hazards	2	2	2	-	2
Geological framework	14	13	12	-	12
Climate	1	1	1	-	1
Mineral resources investigations	23	22	24	-1	23
Coal resources investigations	3	3	4	-	4
Onshore oil and gas and oil shale research investigations	5	5	5	-	5
Uranium/thorium research investigations	4	4	4	-	4
Geothermal research investigations	10	8	8	-	8
Environment aspects of energy	6	8	7	-	7
Offshore geologic surveys	9	12	12	-	12
Water resources investigations	25	27	28	(a)	28
Conservation of lands and minerals	1	1	2	-	2
Land information and analysis	8	9	9	-1	8
Exploration of national petroleum reserve in Alaska	2	2	-	-	-

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[a] Less than $500,000.

TRANSPORTATION

An increase of $16 million, or 2 percent, is proposed for R&D funding in the revised estimate for 1981 for the transportation function. This small increase results from planned decreases in the NASA aeronautical research and technology program.

The increase of $27 million recommended for ground transportation in the revised budget estimates for 1981 includes $12 million from the energy windfall profits tax, which will be used to initiate a new cooperative automotive basic research program jointly funded by industry and Government. The Department of Transportation (DOT) and other agencies, including the National Science Foundation, will participate in this program. Highway safety R&D programs of DOT will also increase in 1981.

R&D budget authority for the air transportation subfunction is expected to decline $16 million, or 3 percent, in 1981. A decrease of $45 million from the 1980 level, including the 1981 budget amendment, is proposed for systems technology within the NASA aeronautical research and technology program. This decline essentially reflects the winding down of the aircraft energy efficiency programs. Funds for support of the NASA aeronautical research and technology base program will continue to increase in 1981. Increases are also proposed for R&D programs of the Federal Aviation Administration (DOT), particularly for activities related to air traffic control.

R&D budget authority for transportation as a percent of total budget authority for this function is an estimated 4.2 percent in 1980 and an estimated 3.7 percent in 1981.

R&D budget authority for transportation

/Dollars in millions/

		1980			1981		
	1979 actual	Jan. estimate	Proposed reduction	Revised estimate	Jan. estimate	Proposed reduction	Revised estimate
Total	$798	$870	-$12	$859	$916	-$41	$875
Ground transportation	192	200	-12	188	236	-21	215
Federal Highway Admin. (DOT)..	50	47	-4	44	48	-	48
National Highway Traffic Safety Admin. (DOT)	52	55	-	55	63	-	63
Federal Railroad Admin. (DOT).	41	43	-	43	46	-1	44
Urban Mass Transportation Administration (DOT)	49	55	-8	47	60	-11	49
Energy Security Trust Fund: automotive basic research ..	-	-	-	-	20	-8	12
Air transportation	543	611	-	611	613	-18	595
Federal Aviation Admin. (DOT).	101	103	-	103	115	-	115
Research engineering and development appropriation (Airport and airway trust fund)	75	75	-	75	85	-	85
Air traffic control	59	56	-	56	66	-	66
Navigation	11	13	-	13	12	-	12
Aviation weather	4	5	-	5	5	-	5
Aviation medicine........	1	1	-	1	1	-	1
Facilities, engineering and development approp.	11	13	-	13	15	-	15
Aircraft safety	9	11	-	11	13	-	13
Aviation medicine	2	2	-	2	2	-	2
Operations appropriation: development direction........	15	15	-	15	15	-	15
Aeronautical research and technology (NASA)	443	508	-	508	498	-18	480
Research and technology base.	110	119	-	119	131	-	131
Fluid physics	19	22	-	22	25	-	25
Propulsion	26	27	-	27	31	-	31
Materials and structures...	15	16	-	16	18	-	18
Avionics flight control ...	4	5	-	5	5	-	5
Human factors	5	6	-	6	7	-	7
Multidisciplinary	4	4	-	4	4	-	4
General aviation	7	7	-	7	8	-	8
Low speed aircraft	11	11	-	11	11	-	11
High speed aircraft	14	15	-	15	15	-	15
Transport aircraft	6	7	-	7	7	-	7

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		1980			1981		
	1979 actual	Jan. estimate	Proposed reduction	Revised estimate	Jan. estimate	Proposed reduction	Revised estimate
Transportation (cont'd)							
Systems technology	154	189	-	189	159	-15	144
Materials and structures...	3	6	-	6	10	-	10
Propulsion	4	7	-	7	6	-1	5
Avionics and flight control	3	3	-	3	2	-	2
Aeronautical systems	5	4	-	4	5	-1	4
General aviation	3	1	-	1	(a)	-	(a)
Low speed aircraft	15	23	-	23	23	-	23
High speed aircraft	10	15	-	15	17	-	17
Transport aircraft	45	59	-	59	41	-7	34
Advanced propulsion	66	73	-	73	56	-6	51
Aerodynamic vehicle	1	(a)	-	(a)	-	-	-
Research and program management	178	200	-	200	209	-3	205
Water transporation	39	39	-	39	44	-3	41
Maritime Admin. (Commerce) ..	19	17	-	17	19	-3	16
Coast Guard (DOT)	20	22	-	22	25	-	25
Other transportation	24	20	-	20	24	-	24
Office of the Secretary (DOT)	12	9	-	9	12	-	12
Research and Special Programs Directorate (DOT)	12	11	-	11	12	-	12

AGRICULTURE

R&D budget authority for agriculture, as revised in March, is expected to increase $32 million, or 5 percent, in 1981 over 1980. This budget reflects a Department of Agriculture (USDA) policy of continuing to emphasize and fund only high-priority research projects essential to the Nation's agricultural and consumer needs and not likely to be otherwise funded. The special areas of emphasis for 1981 include the following:

- An increase of 12 percent, to $274 million, in basic research.
- An increase of $9 million for competitive research grants for basic research critical to food production and human nutrition.
- An increase of $5 million for the human nutrition research program with special emphasis on the relation of nutrition to aging.

R&D budget authority for agriculture as a share of total budget authority for this function is approximately 12 percent in both 1980 and 1981.

R&D budget authority for agriculture

/Dollars in millions/

		1980			1981		
	1979 actual	Jan. estimate	Proposed reduction	Revised estimate	Jan. estimate	Proposed reduction	Revised estimate
Total	$552	$604	-$3	$602	$640	-$6	$634
Science and Education Administration Agricultural research (USDA)	334	365	-	365	387	-3	384
Animal production	66	69	-	69	73	-1	72
Animal production efficiency research	65	69	-	69	73	-1	72
Research on housing	(a)	(a)	-	(a)	(a)	-	(a)
Plant production	132	142	-	142	152	-1	151
Plant production efficiency research	130	139	-	139	150	-1	148
Tropical/subtropical agricultural research	2	3	-	3	3	-	3
Use and improvement of soil, water, and air	43	48	-	48	51	-1	51
Research on conservation and use of land and water resources and maintaining environmental quality	32	35	-	35	37	(a)	37
Research on watershed management	11	13	-	13	14	(a)	14
Processing, storage, distribution, food safety, and consumer services research	72	76	-	76	75	(a)	75
Processing, storage, and distribution efficiency research	52	54	-	54	53	(a)	52
Research to expand agricultural exports	3	3	-	3	3	-	3
Research to improve human health and safety	17	19	-	19	20	(a)	19
Research on consumer services	1	1	-	1	1	-	1
Human nutrition research	22	30	-	30	35	-	35
Science and Education Administration Cooperative research (USDA)	174	189	-3	187	198	-3	195
Payments under the Hatch Act	108	119	-	119	126	-2	124
Cooperative forestry research	10	10	-	10	11	(a)	10
Payments to 1890 colleges and Tuskegee Institute	16	18	-	18	19	(a)	19
Special research grants	16	18	-3	15	16	-	16
Competitive research grants	15	16	-	16	25	-	25
Crop production	10	13	-	13	19	-	19
Human nutrition	5	3	-	3	6	-	6
Rural development research	2	2	-	2	-	-	-
Animal health and disease research	5	6	-	6	-	-	-
Administration	1	1	-	1	2	-	2
Economics, Statistics, and Cooperatives Service (USDA)	36	42	-	42	45	-	45
Office of International Cooperation and Development (USDA)	6	6	-	6	3	(a)	8
Agricultural Marketing Service (USDA)	1	1	-	1	1	-	1
Office of Transportation (USDA)	1	1	-	1	1	-	1

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[a] Less than $500,000.

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Science and Education Administration (SEA): Agricultural Research

A net increase of $19 million, or 5 percent, is proposed for SEA agricultural research in the revised budget. An increase of $3 million in animal production primarily reflects expansion for basic animal research.

A proposed $9 million expansion for plant production includes increases for basic research on crops ($4 million), integrated pest management ($1 million), increases to offset the effects of inflation on the level of program activity and small increases for research on germplasm, guavule (a potential source of natural rubber), and small farms. A partially offsetting decrease of $2 million is proposed for research projects considered not highly essential.

A $3 million proposed increase in soil, water, and air research reflects expanded support for basic research and for research on aerospace technology. The latter program is part of an interagency survey effort on agriculture and resource inventories through aerospace remote sensing (AgRISTARS).

A proposed increase of $5 million for human nutrition research provides for expansion of efforts on the relationship of nutrition to aging, nutritional requirements of pregnant women, factors affecting food choices, and conditions in the human intestine which influence the ability to absorb nutrients.

Science and Education Administration (SEA): Cooperative Research

The 1981 revised budget recommends a net increase of almost $9 million, or 5 percent, in the SEA cooperative research program. The most significant increase ($9 million) is proposed for the competitive research grants program--$6 million for crop production and $3 million for human nutrition. Competitive research grants are meant to complement the ongoing research efforts of the USDA and the State agricultural research community by obtaining the participation of research scientists throughout the entire U.S. scientific community who have outstanding expertise in related areas.

An increase of $5 million is proposed for payments under the Hatch Act with the recommendation that the States strengthen their programs in high-priority basic research.

Partially offsetting decreases result from the proposed termination of the rural development research and animal health and disease research programs.

EDUCATION, TRAINING, EMPLOYMENT, AND SOCIAL SERVICES

This function shows a decline of $118 million, or 26 percent, from 1980 to 1981 after budget amendments. The proposed March reductions of the January levels ($39 million for 1980 and $281 million for 1981) for training and employment reflect a planned phaseout of the Employment and Training Administration program to develop and test models for the jobs portion of the administration's welfare reform proposal.

R&D support for the research and general education aids subfunction is expected to increase $16 million, or 11 percent, in 1981. This subfunction is comprised primarily of R&D programs of the newly established Department of Education, most of which were transferred from the former Office of Education (HEW).

R&D budget authority for education, training, employment, and social services as a share of total budget authority for this function is an estimated 1.0 percent in 1981 compared with 1.5 percent in 1980.

R&D budget authority for education, training, employment, and social services

[Dollars in millions]

	1979	1980			1981		
	actual	Jan. estimate	Proposed reduction	Revised estimate	Jan. estimate	Proposed reduction	Revised estimate
Total	$352	$495	-$39	$456	$637	-$299	$338
Research and general education aids...	144	146	-	146	171	-9	162
Office of Elementary and Secondary Education (Educ)	2	5	-	5	6	-	6
Office of Postsecondary Education (Educ)	1	1	-	1	1	-	1
Office of Vocational and Adult Education (Educ)	7	7	-	7	14	-	14
Office of Special Education and Rehabilitation Services: Handicapped research (Educ)	13	13	-	13	13	-	13
Office of Educational Research and Improvement (Educ)	83	79	-	79	91	-9	82
National Institute for Education..	81	77	-	77	88	-9	79
National diffusion network	2	2	-	2	3	-	3
General departmental management (Educ)	1	2	-	2	2	-	2
Smithsonian Institution	37	39	-	39	45	-	45
Training and employment	118	257	-39	218	365	-281	84
Employment and Training Admin. (Labor)	118	257	-39	218	365	-281	84
Welfare reform	33	175	-39	136	281	-281	-
Youth program	64	66	-	66	66	-	66
Comprehensive Employment and Training Act (CETA)	15	14	-	14	16	-	16
Work incentive program	2	2	-	2	2	-	2
Unemployment insurance program ...	5	(a)	-	(a)	(a)	-	(a)

Education (cont'd)	1979 actual	1980 Jan. estimate	1980 Proposed reduction	1980 Revised estimate	1981 Jan. estimate	1981 Proposed reduction	1981 Revised estimate
Other labor services	10	9	-	9	9	-	9
Assistant Secretary for Policy, Evaluation, and Research (Labor).	2	2	-	2	2	-	2
Bureau of International Labor Affairs (Labor)	1	1	-	1	1	-	1
Bureau of Labor Standards (Labor)..	1	1	-	1	1	-	1
Employment Standards Admin. (Labor)	3	3	-	3	3	-	3
Labor Management Services Admin. (Labor)	3	3	-	3	3	-	3
Social services	80	83	-	83	91	-9	82
Human Development Services (HHS) ..	49	51	-	51	54	-9	45
Administration for Children, Youth and Families	36	37	-	37	41	-6	35
Head Start	NA	11	-	11	11	-	11
Child welfare R&D	NA	15	-	15	18	-6	12
Child abuse	NA	12	-	12	12	-	12
Administration on Aging	9	9	-	9	7	-1	6
Administration for Native Americans	1	1	-	1	1	-	1
Administration for Public Services	3	4	-	4	5	-2	3
Office of Special Education and Rehabilitation Services National Institute for Handicapped Research (Educ)	32	32	-	32	37	-	37

[a] Less than $500,000.

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ALL OTHER FUNCTIONS

The seven remaining functions represent areas in which R&D activities play a relatively small part. In no function does the R&D component amount to more than 2 percent of the total. In another perspective none of these areas accounts for as much as 1/2 of 1 percent of all Federal R&D budget authority in 1981. Collectively, they make up less than 2 percent of the Federal R&D total.

The following tables identify the R&D programs and program areas of the agencies whose missions make up these functions: Community and regional development, international affairs, veterans benefits and services, commerce and housing credit, income security, administration of justice, and general government. The tables are presented in descending order of funding magnitude of R&D programs in 1981.

R&D budget authority for community and regional development

/Dollars in millions/

	1979 actual	1980 Jan. estimate	1980 Proposed reduction	1980 Revised estimate	1981 Jan. estimate	1981 Proposed reduction	1981 Revised estimate
Total	$126	$125	-$8	$117	$142	-$6	$136
Department of Housing and Urban Development	56	48	-	48	52	-1	51
Housing assistance	9	10	-	10	7	-	7
Housing safety and standards research	4	3	-	3	4	-	4
Housing economic data and analyses	12	15	-	15	15	-	15
Consumer and equal opportunity research	6	3	-	3	4	-	4
Community conservation research	11	3	-	3	3	-	3
Community development research	5	7	-	7	7	-1	6
Energy conservation and standards	2	2	-	2	3	-	3
Program evaluation	6	5	-	5	7	-	7
Research program support and evaluation	1	1	-	1	2	-	2
Economic Development Administration (Commerce)	43	46	-8	38	46	-4	42
Tennessee Valley Authority	14	20	-	20	21	-1	20
Federal Emergency Management Agency	13	11	-	11	23	-	23

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R&D budget authority for international affairs

/Dollars in millions/

	1979 actual	1980 estimate	1981 estimate
Total	$113	$124	$131
Agency for International Development	107	59	70
Institute for Scientific and Technological Cooperation	-	60	55
Arms Control and Disarmament Agency	4	4	4
Department of State	2	2	2

R&D budget authority for veterans benefits and services

/Dollars in millions/

	1979 actual	1980 estimate	1981		
			Jan. estimate	Proposed reduction	Revised estimate
Total	$123	$126	$135	-$5	$130
Veterans Administration	123	126	135	-5	130
Medical research	114	115	123	-5	118
Cancer	9	10	10	-	10
Cardiovascular	11	12	12	-	12
Mental health	11	13	15	-	15
Aging	4	4	5	-1	4
Metabolic diseases	15	15	15	-	15
Infectious diseases	8	8	8	-	8
Pulmonary diseases	6	6	6	-	6
Dental	2	2	2	-	2
Nutrition	6	6	6	-	6
Neurological and visual	12	12	13	-	13
All other	32	27	32	-5	27
Rehabilitation R&D	5	8	9	(a)	9
Health services R&D	3	3	3	-	3

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[a] Less than $500,000.

R&D budget authority for commerce and housing credit

[Dollars in millions]

	1979 actual	1980 estimate	1981 Jan. estimate	1981 Proposed reduction	1981 Revised estimate
Total	$92	$107	$119	-$5	$114
National Bureau of Standards (Commerce)	69	74	84	-5	79
Measurement research and standards	34	35	41	-4	37
Engineering measurements and standards	22	24	25	-1	24
Computer sciences and technology	9	10	10	-	10
Central technical support	3	5	8	-	8
National Oceanic and Atmospheric Administration	10	19	20	-	20
National Telecommunications and Information Administration (Commerce)	4	5	5	-	5
Bureau of the Census (Commerce)	3	4	4	-	4
Federal Communications Commission	3	4	3	-	3
Patent and Trademark Office (Commerce)	1	1	1	-	1
Federal Trade Commission	2	1	1	-	1

R&D budget authority for income security

/Dollars in millions/

	1979 actual	1980 estimate	1981 estimate
Total	$36	$38	$56
Social Security Administration (HHS).....	11	14	32
Departmental management (HHS)	25	24	24

R&D budget authority for administration of justice

/Dollars in millions/

	1979 actual	1980 estimate	1981 estimate
Total	$47	$48	$46
Office of Justice Assistance Research and Statistics (Justice)	33	33	33
Bureau of Prisons (Justice)	4	4	4
Customs Service (Treasury)	2	4	3
General administration (Justice)	2	2	2
Drug Enforcement Administration (Justice).	1	2	2
Immigration and Naturalization Service (Justice)	1	1	1
Federal Bureau of Investigation (Justice).	3	2	(a)
Bureau of Alcohol, Tobacco, and Firearms (Treasury)	2	2	1

[a] Less than $500,000.

R&D budget authority for general government

/̲Dollars in millions/̲

	1979 actual	1980 estimate	1981 estimate
Total	$23	$21	$23
Office of Personnel Management	6	7	8
Library of Congress	6	5	5
Bureau of Engraving and Printing (Treasury)	5	4	4
Internal Revenue Service (Treasury)	4	4	4
Advisory Commission on Intergovernmental Relations	2	2	2

END

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